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ABSTRACT

This is a congressional hearing on the Training Technology Transfer Act of 1984, which would establish a mechanism for transferring the Federal Government's investment in computer programming for training systems to those organizations and groups that can use such technology in training the civilian work force. Focus is on refining this bill, which would implement a program specifically charged with the special responsibility for transferring training technology to support vocational education and job training in the private sector and thus promote employment. Testimony includes statements and prepared statements from the president, Community College of Rhode Island; Assistant Secretary of Commerce for Productivity, Technology, and Innovation, U.S. Department of Commerce; editor and publisher, Videodisc Monitor, Falls Church, Virginia; manager of retraining, Motorola training center, Schaumberg, Illinois; Office of the Assistant Secretary of Defense for Manpower, Installations, and Logistics; and vice president for community affairs, the Federal Reserve Bank of Boston, and president of the Boston Private Industry Council. (YLB)

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S. HRG. 98-1062

TRAINING TECHNOLOGY TRANSFER ACT OF 1984

ED251687

HEARING

BEFORE THE

SUBCOMMITTEE ON
EDUCATION, ARTS AND HUMANITIES

OF THE

COMMITTEE ON
LABOR AND HUMAN RESOURCES
UNITED STATES SENATE

NINETY-EIGHTH CONGRESS

SECOND SESSION

ON

S. 2561

ENTITLED THE "TRAINING TECHNOLOGY TRANSFER ACT OF 1984"

JUNE 28, 1984

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TRAINING TECHNOLOGY TRANSFER ACT OF 1984

THURSDAY, JUNE 28, 1984

U.S. SENATE,
SUBCOMMITTEE ON EDUCATION, ARTS AND HUMANITIES,
COMMITTEE ON LABOR AND HUMAN RESOURCES,
Washington, DC.

The subcommittee met, pursuant to notice, in room SD-562, Dirksen Building, commencing at 10:08 a.m., Senator Robert T. Stafford, (chairman of the subcommittee) presiding.

Present: Senators Stafford and Pell.

Senator STAFFORD. The Subcommittee on Education, Arts and Humanities will please come to order.

Although I think Senator Pell and I both feel as though we hardly left this place since last night or early this morning, we welcome you all here. And I have no opening statement.

I will defer to my esteemed and valued colleague, Senator Pell.

Senator PELL. Thank you very much, Mr. Chairman.

I would like to express my thanks to you for conducting these hearings today.

I also want to extend my sincere thanks to each of the witnesses. Some of you have come from considerable distance to testify on this bill, and we are most appreciative of your willingness to interrupt your schedules and offer us the benefit of your opinion.

The legislation before us today is an attempt to match an existing resource with a perceived need. It would establish a mechanism for transferring the Government's substantial investment in computer programming for training systems to those organizations and groups which can utilize such technology in training the civilian workforce.

The goal of S. 2561 thus is to promote employment through new technological training systems. Recent developments in merging the technologies of computers and television—as exemplified by interactive videodisc systems—lend themselves admirably to this purpose. By opening up the Government's reservoir of such technology, this bill could support and promote vocational education and training in a variety of fields and through a variety of channels, several of which are represented by our witnesses here today.

I would observe that this bill seeks to fill a specialized niche in the spectrum of Government technology transfer. There are existing Government programs to promote general technology transfer and there are of course a number of programs to advance vocational training and adult education. But there is not, to the best of our

understanding, a program specifically charged with the special responsibility for transferring training technology to support vocational education and job training in the private sector.

The time would appear to be especially ripe for such a specialized program. We live in an era of technological change and intense international competition. Industrial dislocation is pervasive and persistent in spite of near term economic recovery. Thousands of our citizens need retraining in new skills, and thousands more need special training in basic skills and literacy. Our small businessmen report that one of their biggest problems is finding trained and qualified workers.

We hope that many of these needs can be met by the new technology of training and by sharing the economies of scale of systems already developed by the Government.

S. 2561 is a first attempt to provide the mechanism of transition. It is a homegrown bill in the sense that it is not the product of any particular interest group, and it ventures into some uncharted areas. It may need revamping and revision before it can serve the function for which it is intended. We seek to create a record at this stage which will be the basis for its further evolution. Your testimony here today is the first step in that process.

And our first witness today is Mr. William Spring, vice president for community affairs, the Federal Reserve Bank of Boston; and president of the Boston Private Industry Council established under the Job Training Partnership Act.

Mr. Spring, we value your prospective views as a banker and as a community leader. I appreciate your interest in coming today. Out of curiosity, how did you get here, sir?

Mr. SPRING. By airplane.

STATEMENT OF WILLIAM SPRING, VICE PRESIDENT FOR COMMUNITY AFFAIRS, THE FEDERAL RESERVE BANK OF BOSTON, AND PRESIDENT OF THE BOSTON PRIVATE INDUSTRY COUNCIL [JTPA], BOSTON, MA

Mr. SPRING. Mr. Chairman and Senator Pell, I am here under slightly false colors. I am really just a superannuated staffer. I worked for Gaylord Nelson from 1963 to 1973 on this Committee as well as on his personal staff and worked on education, employment, and training issues in the Carter White House for Stuart Eisenstadt as well.

I now serve Frank Morris. He is the long-term president of the Federal Reserve Bank of Boston. He is also chairman of the Boston Private Industry Council and chairman of the Trilateral Council for Quality Education in Boston, an organization which has been trying to help some 25 Boston businesses who are partners with Boston public high schools.

We have made, and I was—I came to work for him as a consultant first and then in January was made vice president for community affairs of the Federal Reserve Bank.

We in Boston are very proud of the effort that the city, their Mayor White and now under Mayor Flynn, that schools and the business community are working together and grappling with prob-

lems in Boston which despite our very strong economy are extremely serious.

Boston is a city with one of the largest fractions of its population poor of any in the country. We have made the agonizing long transition from a manufacturing to a knowledge-based industry, and that is good.

We face relatively low unemployment by national standards, and that is good.

But those jobs now require, not without exception but largely, certainly all the jobs which pay adequate income for a man to support his family or for a woman to support her children, those jobs require basic skills. And our estimates are that as many as 100,000 of Boston's roughly 550,000 population lack functional literacy As you know, the national numbers are even more startling, 32 to 56 million are the estimates of the people who are not prepared now to make the kind of contribution they need, their families need and the Nation needs to the industrial prospects this country has in the future.

So what do you do about it? Well in Boston we have launched an adult literacy project with the universities, the school system, the city and the private sector all collaborating.

We now have some 14 centers of training. We have through the University of Massachusetts and Boston and Roxbury Community College, a kind of a center for study and for training. We think we are making great progress. In fact, we have increased by threefold the number of adult high school equivalency degrees granted in Boston. However, with all this forward progress, $1 million of community block grant money committed, we are still only reaching 1,200 people a year.

Under these circumstances, it is going to take us 100 years to see the light at the end of the tunnel, and that is just not acceptable.

How do we get from here to there? We believe that education technology offers a very promising avenue which is worth serious exploration. It is not a secret, although I must say Senator Pell, I was surprised to read your $262 million figure for the Defense Department's investment in educational technology. It is a substantial amount of money but it is no secret that the Department of Defense has developed a videodisc, a computer-assisted learning technology for basic skills for young people coming into the Army who may be in trouble. I know that getting into the Army now requires a high school degree, but we found in Boston in our employment and training programs that almost half of the applicants to our training programs, many of whom have high school degrees, lack functional literacy.

Well, it is no secret that the Army developed the technology for basic skill instructions with this rather remarkable videodisc-assisted technique.

If there were a way of transferring that technology so that it would be usable for us in Boston, we would want to participate very much. We have been talking to a number of electronics companies in Eastern Massachusetts, we have been talking to the University of Massachusetts, we are in fact exploring ourselves the possibility of developing basic skills software for such a system.

It turns out the best estimates are—you are talking about $1 million or $1.5 million to develop the courseware.

Now, I know if you are developing in courseware to teach them how to fix typewriters, that is good for $100,000 or $200,000. But if you are talking about a basic skills project, which is a substantial operation, it takes time, it takes money.

If the taxpaying public have already invested in people and time and experimentation to make such a system work, then having a way to make that system available to the public schools of Boston and to the employment and training program in eastern Massachusetts is what I think would be sound, sensible and very much in the public interest.

We believe in Boston that the future of adult education lies in large part in lowering the cost of providing high quality competency-based education to people.

The most attractive thing about this technology is that by combining sound and visual programs with an ability to keep the teaching material right at the cutting edge of the person's perception, allows you to make progress in this field where we have had, despite a number of years in adult literacy efforts, not made that much progress in the past.

In talking to the electronic firms, they argue that teaching people mechanical skills, the repair of machinery, that these—that this technology cuts the time almost in half and increases the learning of the average person taking the course very substantially. To say that 90 percent of your people must learn 90 percent of the material is out of the question when you are able to concentrate on the learning pattern and keep your material at the cutting edge of learning for each individual.

So in short, we believe that there is a large need in the training and the education world for the kind of technology we already have invested substantially in through the Defense Department. We believe that the Training Technology Transfer Act of 1984, S. 2561 represents a modest first step.

NASA has demonstrated that thinking through carefully how space technology could be transferred to a civilian use can in fact speed that process. We believe that the same careful thought and careful structure can have similar good effects in education technology.

So Senator Pell, we congratulate you on introducing this bill and want to say how much—and the people that I have talked to think it is a good idea.

Let me finally end with a disclaimer, however. I am not testifying in any sense on behalf of the Federal jurisdiction or the Federal Bank of Boston. In fact, I am not even testifying on behalf of the board of directors of the Private Industry Council. I am here as a private citizen who has been working on these issues.

So let me thank you for an opportunity to testify and ask to include in the record some information about our adult literacy program in Boston.

Thank you.

[The prepared statement of Mr. Spring and a copy of the literacy program in Boston follows:]

July 28, 1984

Testimony prepared for the U.S. Senate Subcommittee on Education on S. 2561, "The Training Technology Transfer Act of 1984"

by William Spring
President, Boston Private Industry Council

Mr. Chairman, let me thank you for this opportunity to testify on Senator Pell's legislation to make training education technology developed by the federal government, especially the Defense Department, more readily available to the people of this country.

Let me begin by saying that I am here today at the request of the Committee and as a private citizen.

I work for Frank Morris, President of the Federal Reserve Bank of Boston and Chairman of the Boston Private Industry Council. I am president of the PIC. But my views today do not represent the position of either the PIC or the Federal Reserve Bank.

I want to testify in favor of this legislation, from the perspective of a person working with the training challenge facing one American city.

As you are well aware the national estimates of the number of people functionally illiterate range from 30 million to 56 million.

Boston has a strong economy. And since we have gone through the very painful years of adjustment from a manufacturing to a knowledge-based economy,

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we believe that the potential for future prosperity is great. But the very opportunities of a knowledge-base economy presents a challenge to the poor and to education.

Gone are the jobs where a man could support his family--or a woman could support the children in her home--with a job requiring only willing hands. Now a solid basic education is critical to self support and contribution to the community.

In Boston, we have put together an innovative program to attack adult illiteracy. With one million dollars of community development block grant funds, the city--in collaboration with community-based organizations, the university and the business communities--has mounted a program that will serve some 1,200 people during its first full year, and increase by three-fold that number of people earning adult high school diplomas.

There are fourteen learning centers run by community-based organizations to assure that each of our city's diversity of ethnic groups are fairly served. And the University of Massachusetts--Boston and Roxbury Community College--have established a resource institute for the monitoring of progress and the training of staff.

We are very proud of this initiative. But with an estimated 100,000 Bostonians in need of the program it will take us roughly 100 years at our current rate to reach light at the end of the tunnel.

If we are going to get this job done in any reasonable length of time, we need a much better education and training technology. Such as may well lie within the potential of interactive video-disc computer assisted technology.

We have been discussing--with a leading Massachusetts electronics firm--the possibility of developing a basic literacy software for such a system. The best estimate available to us is that the cost would approximate $1.5 million dollars in staff time alone.

Now comes consideration of the Pell Legislation. The work that the Defense Department has done in this area is hardly secret. But the distance between knowing that the Defense Department has developed a basic-literacy curriculum for inter-active video and making that technology in anyway available to the people in Boston is long indeed.

NASA has shown us that careful thought and organization can speed the application of space hardware to the civilian economy. It is the purpose of this bill to speed the application of defense and other federally developed education and training technology to the general public.

I believe that the legislation as proposed represents good sense.

In his introductory remarks April 11th, Senator Pell states that the Defense Department spent $256 million in 1982 on educational and training technology. Such a heavy capital investment makes sense to the Pentagon because the investment per trainee, spread over hundreds and hundreds of thousands of service men and women is low. For the individual American school district or city such heavy investment is not possible. But if the results of such public expenditure could be made available to local education and training agencies the benefits might well make a significant difference to the nation.

Let me return to the Boston drive against illiteracy. Now we have fourteen neighborhood centers relying mostly on paper and pencil teaching methods. Suppose instead of being able to progress only at the center when it is open and the teachers on hand and the class not too crowded and the student can find time in a schedule crowded with work and family responsibilities, suppose that instead each community school and community center and branch library had an interactive video-disc teaching center with a battery of machines able to provide instruction and to very accurately moniter individual progress. If we were then able to reach tens of thousands of people in Boston rather than the one thousand per year we are reaching now the prospect of ending functional illiteracy might be real. Such a hope depends, of-course, on lowering the cost of the machines, which we are assured will happen. But it also depends on the development of basic literacy courseware and experience with the use of the technology.

The Pell bill gives some hope that we in the civilian sector may have a chance to gain informed access to the work already paid for by the taxpayer and carried out by the Defense Department. I believe the legislation deserves support.

ADULT LITERACY INITIATIVE

City of Boston

Neighborhood Development and Employment Agency

Kevin H. White, Mayor
Paul S. Grogan, Director

Summer 1983

THE PROBLEM

The City of Boston's Neighborhood Development and Employment Agency (NDEA) administers job training and placement programs for Boston youth and adults. Serving several thousand residents each year, the NDEA has found that a large number of the unemployed and underemployed adult clients seeking NDEA services is severely undereducated and, therefore, unable to qualify for these programs. Possessing reading and math skills at a fifth grade level, the functionally illiterate experiences difficulty in tasks such as reading a job application, a consumer product label or a bus schedule. The problem of adult illiteracy is illustrated in the following national and local statistics:

- One of five adults in the United States has been determined to be functionally incompetent;
- The national annual dollar costs include $6 billion spent on welfare programs and unemployment compensation due to illiteracy and another $6.6 billion to support 700,000 illiterates in prison;
- It is estimated that by 1985 65% of all jobs will be information handling rather than goods handling;
- In Massachusetts, 27% of adults 25 years and over have not completed high school. With 1.4 million adults in this category, Massachusetts ranks in the 'top ten' among all states with record levels of adults lacking high school completion;
- In 1981 Massachusetts ranked 11th among states receiving new immigrants. In just the past two years 21,000 refugees have entered Massachusetts. Of these, 15,000 are illiterate and require AFDC. These figures do not take into account illegal immigration which studies conservatively estimate at an equal share;
- 32% of Boston's adults (25 years and older) have not completed their high school education;
- Among minorities educational completion rates are staggering. 52% of all Hispanic adults; 38% of all Black adults; and 45% of all Asian adults in the City of Boston lack high school diplomas;
- 50% of Boston's CETA participants enrolled in Basic Skills programs are high school graduates yet could not meet entry requirements for skills training programs;
- 32% of all jobs in Boston are professional, managerial or technical while only 21% are in the areas of production and maintenance. Even within the latter two areas, however, 40% of all positions are in the skilled craft areas.

THE ADULT LITERACY INITIATIVE

The City of Boston recently launched the Adult Literacy Initiative designed to combat the growing problem of functional illiteracy among the Boston adult population. The initiative is sponsored by the Neighborhood Development and Employment Agency in collaboration with Goals for Boston, the Boston Private Industry Council, the Boston Public Schools and the Boston Housing Authority.

The goal of the initiative is to offer an occupational focus to basic educational instruction to Boston residents whose lack of basic competencies, English language skills or high school certification impede their labor force entry and mobility.

To achieve this goal, the initiative aims to:

- coordinate and improve the disparate adult education efforts which are currently operating in the City of Boston,
- initiate new practices and concepts in the field of adult basic education in Boston, most importantly, that of 'occupational literacy' and
- reach out to unserved or underserved segments of the adult population in need of competencies and/or certification and experiencing employment difficulties.

The initiative, is designed to provide a grass-roots approach. The NDEA, working in consultation with its advisory board (see Appendix A), has designated fourteen neighborhood- based learning centers to carry out the educational programs (See Table 1). The neighborhood learning centers will offer a flexible approach to education, suiting the individual needs of students. Opportunities for instruction will vary according to demand; some teaching needs will include:

- competency-based learning, using life experience to develop basic skills such as problem solving and communication;
- occupational literacy, with such workshops as resume writing or interviewing;
- non-credentialing alternatives, such as English language skills classes, and
- GED preparation or External Diploma programs for those who desire certification.

In addition, the Resource Institute operated jointly by the University of Massachusetts/Boston and Roxbury Community College, will provide technical assistance, teacher training, curriculum development and volunteer management.

The NDEA, through the use of Community Block Grant funds, has committed one million dollars to this effort for the next year. The Permanent Charity Fund of Boston has made a major contribution

to the initiative, a $100,000 challenge grant for the first year, to leverage additional private dollars. The Fund has also made a long-term commitment to set up a fund for future philanthropic and corporate support of the initiative. Additionally, the Boston Housing Authority has committed $50,000 to the program.

The formal public launching of the initiative was held on June 10, 1983 at the WAITT House in Roxbury, one of the newly-designated program sites. The announcement of the program was made by Mayor White, Mrs. George Bush of Washington, D.C., NDEA Director Paul Grogan and Permanent Charity Fund Director Geno Ballotti.

Mrs. Bush, a national leader in the fight against illiteracy, cited Boston's initiative as "an important and necessary program serving hard-to-reach illiterate adults"and commended the City for its leadership role in addressing the issue on a grass-roots level as well as its innovative use of federal funds to stimulate private match funding.

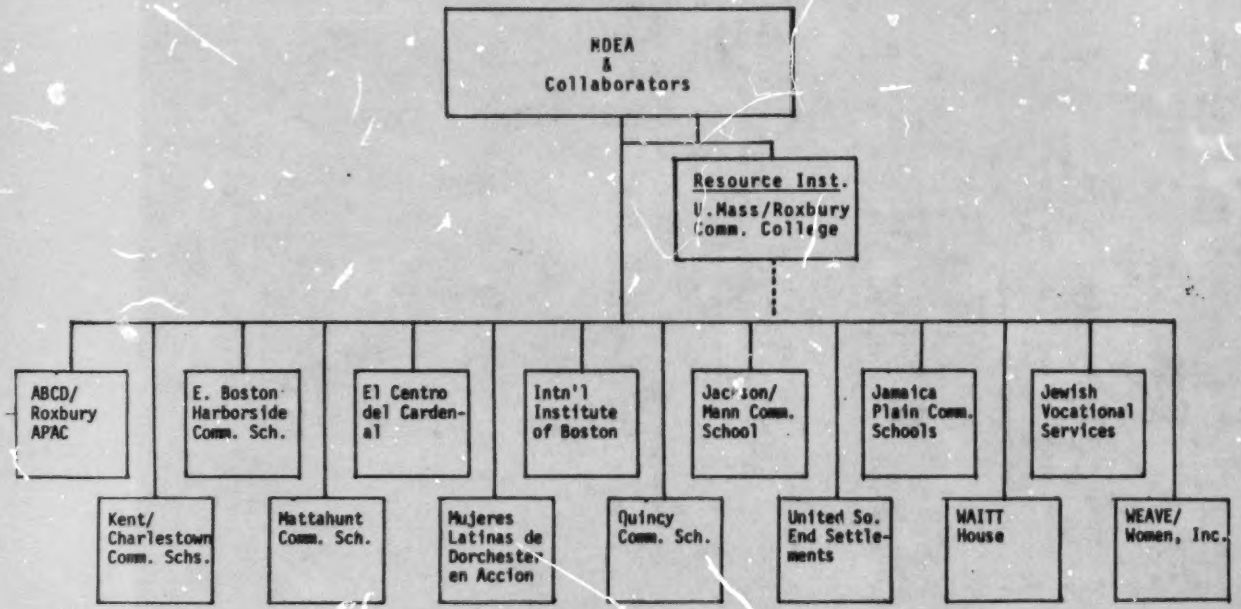
"Boston's effort demonstrates how a city can aggressively attack a compelling educational and social problem on a local level, "Mrs. Bush said. "This grass-roots approach recognizes the need for accessible, flexible education. I hope it will set a precedent for other cities to follow."

The fourteen neighborhood-based literacy programs will begin operating this summer, and be in full swing by early fall 1983. Approximately 1,000 adults are expected to be served in the first year.

Table 1.

ADULT LITERACY INITIATIVE

Organization Chart



ADULT LITERACY PROGRAM SUMMARIES

The following neighborhood-based organizations have been designated to carry out the Adult Literacy Initiative.

A.B.C.D./Roxbury APAC

The Roxbury A.B.C.D. Basic Skills and Competency Program will provide 100 Boston residents with self-paced, competency-based instruction in cognitive, occupational and life skills. Upon program completion, participants will have achieved a functional literacy level adequate for entry into a job, a skills training program or the Adult Diploma Program. Student services will be offered through a citywide adult learning center and a community center located in the Roxbury APAC.

East Boston Harborside Community School

The East Boston Adult Literacy project will serve 65 residents of East Boston at the Harborside Community School. The instructional approach will be tailored to individual learning needs for basic skills, special skill competencies and English proficiency and will employ the use of computers.

El Centro del Cardenal

El Centro del Cardenal will implement a competency-based ESL program targeted for Hispanic residents of the South End/Upper Roxbury area with a specific focus on the Cathedral Housing Development. The objective of this Hispanic Adult Basic Lifeskills and English (HABLE) program is to increase the educational levels of Hispanic adults thereby affording them access to available jobs and admission into various vocational training programs. This program will be coordinated with that of United South End Settlements. The project will serve 80 clients.

International Institute of Boston

The International Institute of Boston will implement a Special Project for English Language Literacy (SPELL) to provide cometency-based ESL and occupational literacy to French speaking Haitian immigrants residing in the North Dorchester/Franklin Field area of Boston. The program will be provided by professional ESL staff and will be supplemented by on-site volunteers trained and supervised by IIB staff. The project will serve 50 clients.

Jackson/Mann Community School

The Jackson/Mann Community School will operate Project ACCESS (A Community Competency-based Education Service for Adult Students). This program will serve 70 Allston/Brighton residents by providing two components: a basic life skills component which will increase basic literacy skills through a life-focus competency-based curriculum and an External Diploma Program which will provide adults with opportunities for certification. Tutoring will be available along with a learning lab, on-site daycare, and counseling service. The Jackson/Mann program will target services to residents of the

Faneuil and Fidelis Housing Developments.

Jamaica Plain Community Schools

The Adult Literacy Program will provide competency-based adult educational services to 100 adults from the Jamaica Plain, Roslindale, and Roxbury neighborhoods. The program targets low-income, non-English speaking or educationally disadvantaged adults living in the Archdale, South Street and Bromley Heath Housing projects, the Brookside neighborhood of Jamaica Plain, and Northern Roslindale. The program will improve educational levels of clients by providing an individualized plan of self-paced instruction in a learning center at Jamaica Plain High Community School in which an adult may receive up to 32 hours per week of instruction and remediation.

Jewish Vocational Services

The Jewish Vocational Service will provide literacy, ESL and basic math instruction for 110 Indochinese refugees residing primarily in the Brighton/Allston area of Boston. The objective of this instruction is to assist clients to reach a skill level which will enable them to pursue further training and education, and therefore achieve their full occupational potential.

Kent/Charlestown Community School

The Kent/Charlestown Community School will offer an External Diploma Program in conjunction with basic skills preparation targeting AFDC mothers residing in public housing. The proposed program will involve classes in communications, interpersonal relationships, occupational and cognitive skills. In addition to providing for an environment which promotes peer teaching and independent learning, participants will have access to daycare and counselling services. This project will serve 50 clients.

Mattahunt Community School

The Mattahunt Community School will operate a competency-based program of instruction and assessment for adult residents of Mattapan, South Dorchester, Hyde Park and Roslindale. This agency currently operated a GED preparation program and will expand to offer instruction leading to the acquisition of an External Diploma. Clients will receive preparation in academic subjects along with career development workshops, occupational assessments, and counselling. 50 clients will be served.

Mujeres Latinas de Dorchester en Accion

Mujeres Latinas de Dorchester en Accion is a daytime, English as a Second Language program designed for low-income minority women of Dorchester many of whom live isolated by language and cultural barriers from society at large. The Mujeres' classes are geared for women with very limited previous education. The program objective is to offer language instruction in a way that promotes critical thinking and a positive self-image leading to self-reliance. All instruction is competency-based and emphasizes vocational preparedness. Weekly workshops will be led by guest speakers on topics ranging from health issues to home weatherization to reinforce the

academic aspects of the program. Counselling and free childcare will be offered to aid in retention of clients. 65 clients will be served.

Quincy School Community Council

Building on seven years of experience, curriculum and materials, the QSCC Adult ESL Program will provide: (1) ESL Instruction at the beginning levels to 30 Asian immigrants through an addition of bilingual classes and a further development of their competency-oriented curriculum; (2) a Transitional Component serving 60 Asian intermediate level ESL students which focuses on developing occupational literacy competencies which will facilitate the difficult transition from a bilingual/bicultural environment to the English-only environments of educational and vocational training programs and most places of employment; (3) Tutoring Component, serving 35 Asian immigrants enabling both supplementary and primary individualized instruction through a subcontract with the 'One With One' Program; (4) Learning Lab Component which will incorporate intensive career exploration, a language lab, and drop-in instructional and supportive services; and (5) a full range of bilingual advocacy, counseling, referral and translation services; and (6) on-site childcare during class hours. The unduplicated count of individuals to be served is 110 in the first year.

United South End Settlements

The United South End Settlements will implement a competency-based basic skills and External Diploma program targeted for non-Hispanic residents of the South/Upper Roxbury area of Boston with a specific focus on the Boston Housing Authority's Cathedral Housing Development. Employability development will be a key focus with occupational workshops included in the program design. 50 clients will be served in coordination with the program operated by El Centro del Cardenal.

WAITT House

The WAITT House (We're All In This Together) is located in the Roxbury/Dudley section of Boston and will offer a solid, competency-based program with three components: External Diploma; Job Preparation; and Basic Skills Instruction. WAITT House opened in 1979 and currently serves a multi-ethnic population through activities such as community outreach, daycare, and adult education programming. Proposing linkages with other agencies, a diverse staff, and provision of strong client supports including daycare, advocacy and counselling, this program is designed to reduce or eliminate the critical barriers which cause high attrition in many other adult education programs. This program will serve 65 clients.

WEAVE/Women, Inc.

WEAVE will provide competency-based instructional and assessment services to 100 low income, educationally disadvantaged adult female residents of Roxbury and Dorchester. These services will be offered through an open entry/open exit skills development program in which students will contract to develop particular competencies in basic skills, job readiness skills, and life management and problem-solving skills. Competence in these areas will lead to successful performance and for at least 60 students will result in entry into an instructional and assessment program for the competency-based External Diploma awarded in conjunction with the Boston Public Schools.

APPENDIX A

ADULT LITERACY INITIATIVE

BLUE RIBBON PANEL MEMBERS

Marilyn Anderson Chase, Director
Governor's Office of Community Service

Kathy Atkinson, Director
Bureau of Student, Community & Adult Services

Dr. Jeanne S. Chall
Harvard Graduate School of Education

Robert Corrigan, Chancellor
University of Massachusetts

Ann Crowley, Vice President
Shawmut Bank of Boston

James Darr, Executive Director
Boston Private Industry Council

Ellen Guiney, Executive Director
Citywide Education Coalition

Dr. Kenneth Haskins, Director of Field Experience
Harvard Graduate School of Education

Dr. Gerard Indelicato, Special Assistant to the Governor
Educational Affairs

Frank Jones, President
Boston Committee

Dr. Jacquie L. Kay, President
WU P, Incorporated

Kevin McCluskey, President
Boston School Committee

Nelson Merced, Executive Director
Alianza Hispana

Hassan Minor
Corporation for Boston

Daniel Morley, Vice President
State Street Bank & Trust Co.

Dr. Vincent Muccio, Director
Curricula and Instruction
Boston College

Wendy Puriefoy, Director
Permanent Charity Fund

Miguel Satut, Director
Oficina Hispana

H. Lewis Spence, Receiver
Boston Housing Authority

Dr. Robert Sperber, Coordinator for the President's Steering Committee
Boston University

Dr. Robert Spillane, Superintendent
Boston Public Schools

William Spring, President
Boston Private Industry Council

Michael Taylor, Director
South Boston Neighborhood House

Ann Tobey, Community Relations Officer
First National Bank of Boston

Joseph Warren, Director of Community Affairs
Northeastern University

Appendix B

Goals For Boston June,1983

ADULT LITERACY INITIATIVE LAUNCHED

Estimates suggest that 100,00 Boston adults have not completed high school, and that an equal number are functionally illiterate, possessing only a fifth-grade level of reading, writing and computation skills. To combat this problem, Boston recently announced an Adult Literary Initiative, which will support a series of neighborhood-based learning centers providing basic educational programs to 1,000 adults annually. The City's Neighborhood Development and Employment Agency (NDEA) has committed $1,000,000 of Community Development Block Grant funds to the Initiative. NDEA was supported in establishing this effort by Goals for Boston, the Private Industry Council, and the Boston Housing Authority.

Mayor Kevin H. White announced the creation of the Literacy Initiative at a press conference at WAITT House in Roxbury on June 10. In his remarks, the Mayor said, "The education of our entire workforce is essential. Bostonians lacking basic competency in reading, writing and math skills must be prepared to keep pace with the demands of the labor market in the information age." He was joined by Barbara Bush, the wife of the Vice President of the United States, who has campaigned vigorously across the country on behalf of increased adult literacy. Mrs. Bush applauded Boston as the first city in the nation to undertake such a major program to expand adult basic education and link it to the employment and training system.

NDEA's financial contribution is the foundation of what will become a larger pool of money directed at this problem over time. The first two additional contributions came from the Permanent Charity Fund of Boston, a $100,000 challenge grant to leverage private dollars, and the Boston Housing Authority at $50,000. In addition, PCF will establish a fund for philanthropic and corporate support of the Literacy Initiative.

Fourteen community-based organizations reaching virtually every neighborhood in the city have been designated to operate the adult education programs. They will offer a flexible approach suited to the individual needs of the students. Curriculum offerings will include competency-based learning, using life experience to develop basic skills such as problem-solving and communication; occupational literacy, with workshops in resume-writing and interviewing; English-language classes; and GED or External Diploma preparation for those adults seeking certification.

The Adult Literacy Initiative, consistent with the basic premises of Goals for Boston, focuses on the recognition of significant areas of need and the marshalling of resources—public and private—to meet those needs. The Initiative is another example of active development of public-private partnerships in our city.

Mayor Kevin H. White announces the launching of Boston's Adult Literacy Initiative, a program to combat functional illiteracy among Boston adults. Joining the Mayor is Mrs. George Bush, who has chosen literacy as her major issue during her husband's vice presidency, and Paul Gregan, Director of the Neighborhood Development and Employment Agency, sponsor of the initiative.

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The Boston Globe
Founded 1872

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Help for Boston's illiterate

Illiteracy strangles the potential success and threatens the survival of an estimated 100,000 adults in Boston. They can't read well enough to fill out a job application or to decipher the label on a can. They lack other important skills too.

Fortunately, help is on the way. Fourteen adult learning centers, run by community groups, will start or expand in almost every neighborhood before the end of summer. Approximately 1000 adults are expected to benefit the first year.

The city will foot the bill with $1 million in federal community development funds channeled through Boston's Neighborhood Development and Employment Agency.

Mayor White and the NDEA deserve praise for this forward-thinking campaign. It reflects some new priorities.

The NDEA is charged with increasing jobs, encouraging commercial revitalization and improving the housing stock. This effort recognizes the connection between skills and employment.

Work has changed. The old opportunities for advancement in unskilled slots are disappearing. New opportunities are growing daily as the downtown development boom continues. Workers will fill those new offices, but only if they have the necessary skills.

The causes of illiteracy are numerous. Some adults simply did not learn. Others attended poor schools or dropped out. Many immigrants battle a language barrier.

The city's literacy program is unique in some postive ways. It establishes a resource institute, a joint endeavor by Roxbury Community College and UMass-Boston. That links higher education and neighborhood action, two of the area's strengths. Though details must be worked out, the institute has the potential to improve management of the literacy program, develop new curriculum and be a conduit for shared information so that successes can be duplicated.

The adult learning centers will be set up in existing community centers. That locates the opportunity close to those who need it in familiar locations.

Besides reading lessons, the curriculum will include language skills, problem-solving techniques and job-related lessons such as how to write a resume or interview successfully.

Boston's commitment is crucial. The Reagan Administration has continually reduced federal funds earmarked for adult basic education even as the illiteracy problem worsens nationally. But the $1 million earmarked here and the additional $50,000 given by the Boston Housing Authority is not enough.

The private sector, businesses and individuals, must help. The mechanism is already in place. The Permanent Charity Fund of Boston has set up a literacy fund for contributions. The fund has also issued a challenge grant of $100,000, which must be matched by donations before it can be used.

Businesses and corporations should invest in the development of a skilled labor pool. Employers will benefit as much as the individuals who improve themselves.

The Boston Herald, Monday, June 13, 1983

The Boston Herald
ROBERT L. PAGE, Publisher
JOE ROBINOWITZ, Editor
LESLIE HINTON, Associate Editor
One Herald Square, Boston, Mass. 02106
Telephone (617) 426-3000

Good way to start war on illiteracy

AN ESTIMATED 100,000 Boston adults or 32 percent of the population over age 25 have never completed high school.

An equal number are believed to be functionally illiterate. That is, they have no more than fifth grade reading, writing and math skills. Given those distressing statistics is it any wonder that Boston people have difficulty competing in today's highly competitive job market, a market where nearly one-third of all jobs are professional, managerial or technical?

The city's Neighborhood Development and Employment Agency, which has seen the extent of the problem first hand, has come up with a new program to help combat adult illiteracy. The new grass roots program is expected to serve about 1000 adults at 12 to 14 neighborhood-based learning centers. It is funded by a $1 million federal grant — part of the Community Development Block Grant program — as well as $100,000 from the Permanent Charity Fund of Boston and $50,000 from the Boston Housing Authority.

And the list of those businesses and individuals willing to give their time and their money to help solve the problem of illiteracy in Boston need not end there. It's Boston businesses as well as its residents who will directly benefit from the Adult Literacy Initiative, as it has been named.

Limited in scope, the program can only begin to make a dent in the problem. But it's a darned good way to start.

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Bridging The Education Gap

This is another in a series of columns dealing with topical issues of interest to all Bostonians, to be published in this newspaper, written by Mayor Kevin H. White.

Readers are invited to forward to the Mayor, through this newspaper, topics for treatment in the column and responses.

By Mayor Kevin H. White

Before announcing the city's new Adult Literacy Initiative on June 16, I reviewed some statistics included in a memo that one of my staff members sent to me. To put it mildly, the figures were disturbing.

According to these statistics, up to 34 million adults in this country are "functionally illiterate" and have difficulty in such tasks as reading a job application, a consumer product label, or a bus schedule. And, to bring the problem closer to home, this situation does not stop outside our city limits: it is estimated that 100,000 Boston adults have not completed high school and that an equal number are functionally illiterate.

This emphasizes just how important our recently launched Adult Literacy Initiative is—not only to these adults in our community who need educational help, but to the future of Boston as a prospering city.

Let's look for a moment at what's been happening in Boston for the past couple of decades and what's happening now at an accelerating pace. First, we look back and see that our city has changed from an urban center basically oriented to manufacturing goods to one that now is service-oriented, with a strong influence of high technology. Today 32 percent of all jobs in Boston are professional, managerial or technical, while only 21 percent are production and maintenance jobs. And even in these latter two areas, two out of every five jobs demand skilled crafts.

In other words, today's jobs are demanding workers with better educations than the labor force in general needed in the past. And, in today's "information age," the trend is quickening.

Another way of looking at the situation is this: Boston is generating more jobs that require more skills than ever before. To help ensure that Bostonians share in the benefits of the city's economic boom, my administration has launched a number of initiatives. The Adult Literacy program is the latest, and certainly one of the most basic, of these initiatives.

What we are doing in our city—and I hope it sets a precedent elsewhere in the country—is finding better ways to bring adult education into our neighborhoods in an effort to bridge the gap between the skill levels of today's functionally illiterate and the skill demands of today's job marketplace.

Our Adult Literacy Initiative is an effort to integrate and expand our present adult basic education facilities, and to connect them with the existing training and employment system.

Logistically, this will involve 14 neighborhood learning centers to serve about 1,000 adults a year.

To fund this essential program, the city's Neighborhood Development and Employment Agency (NDEA) has committed $1 million in Community Development Block Grant funds to support the various neighborhood-based educational projects, which will include problem solving, English language skills, and occupational literacy (such as workshops in resume writing and job interviewing).

In short, this is a grass roots approach.

But it is backed with not only federal funding, but private sector resources as well. Importantly, the Permanent Charity Fund of Boston has contributed a $100,000 "challenge grant" to leverage additional dollars from the private sector. For the private sector, the investment made will be returned with dividends in the form of a workforce equal to the greater demands placed upon it by progress.

And the statistics I mentioned at the start of this article show that we have no time to lose in educating those who need it in order to keep up with the changing times. By 1985, about two out of every three jobs will involve information handling, rather than the goods handling that predominated when manufacturers were the major employers.

There are no easy solutions to meeting the changing needs of the job marketplace. It will take much hard thought and hard work, and I think the Adult Literacy Initiative is a significant move in the right direction.

Though I don't believe in simplistic answers to complex problems, I do believe in starting from "the basics" in building a solution. In Boston, the basic and indisputable idea is that our residents are, as a group, the key to the future of this city. By being prepared for today's jobs and tomorrow's, Bostonians will be sharing in their city's progress, and adding to her strength.

Boston Herald Tribune 6/23/83

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Senator STAFFORD. Thank you, Mr. Spring.

Senator Pell, do you have questions?

Senator PELL. Yes, thank you, Mr. Chairman.

I have one. And that is: In your view, Mr. Spring, are you satisfied that the bill makes adequate recognition of the role of the Private Industry Councils and the existing framework of the Job Training Act?

Mr. SPRING. Part of your bill which I find most thoughtful is setting up a small unit which would make a catalog of what is going on. That would be extremely helpful.

The second part I like about the bill is that it talks about dealing with small grants in trying to effect this transfer process.

I would like to see the—to make sure that in the Advisory Council that the Job Training Partnership Council is represented and I think it ought to be made clear in the text of the bill and in the remarks that you are reaching out to the world in the private councils. As you know, Senator, we struggled for some years to effect working private sector involvement in the structure of our training programs in States like Vermont, Senator Stafford's State, where the business community and the local political leadership are working in smaller cities on a face-to-face basis. This is not so difficult and those States, organizations like the Employment Service, I guess the Job Service calls it, works itself very well.

In the large cities these sectors tend to become—talk to one another and then shout across to each other through the newspapers.

We believe that the Private Industry Council is a beginning step toward structuring a useful and effective private sector involvement and we believe that anything that can strengthen that role over the next few years would be helpful.

Senator PELL. In your own city of Boston do you find that there is as much adult literacy?

Mr. SPRING. It is a serious problem, Senator Pell.

Senator PELL. In that regard, what is the Private Industry Council doing about it?

Mr. SPRING. In Boston, after the Private Industry Council legislation was adopted as an amendment to the CETA Act of 1978, if I may say so, at the initiative of the Carter administration, Boston immediately began under Mayor Kevin White and the leadership of David Mendell, Boston immediately began to treat the Private Industry Council as a board of directors for the entire employment system. The adult literacy initiative was begun in the White administration and strongly supported in the Flynn administration by NDEA, the city's employment and training agency. The PIC is the board of directors for that agency and it has been heavily involved in planning. It is involved in the Advisory Committee and, in a modest way, to the financial contribution which is largely financially supported by community block grant money.

Senator PELL. Thank you. Thank you very much.

Senator STAFFORD. Thank you very much, Mr. Spring.

The next witness will be Mr. John Robinson who is manager of retraining, Motorola Training Center, and a member of the National Issues Committee of the American Society for Training and Development from Schaumberg, IL.

Mr. Robinson, we would be pleased to hear from you.

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STATEMENT OF JOHN ROBINSON, MANAGER OF RETRAINING, MOTOROLA TRAINING CENTER, SCHAUMBERG, IL; AND MEMBER OF THE NATIONAL ISSUES COMMITTEE OF THE AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT

Mr. ROBINSON. Thank you. I am delighted to be here.

I am speaking on behalf of the American Society for Training and Development. I also would like to enhance my remarks on their behalf with some of our experience in Motorola.

As you may know, the American Society for Training and Development has a membership of approximately 50,000 people. It is one of the largest organizations concerned with retraining nationwide.

We have considerable enthusiasm for what the bill represents. We would like to make several suggestions to enhance the bill.

One of the most important things to be found in Motorola in transferring technology and providing retraining for people has been the interface between the individual and technology. We do see cases where the time it takes to learn the technology for people who are already employed may be longer than the life of the technology itself.

I can think of several individual cases; one is an employee named Carolyn Cortez who spent 14 years acquiring technician-type skills for her job. She started without a high school degree, and she now has a 2-year community college degree in electronics. She is now qualified as an associate in electrical engineering.

When you ask her what her priorities are in life, she says, "family, education and a job." When you ask her how she accomplished it, she says: "Well, I had to change my course of study three times during the 14 years to meet the graduation requirements because of changing technology."

One of the reasons we are here today is to support what you are doing and encourage transfer of technology out of Government into the private sector to accelerate the rate of learning. We do find that about one-third of the people who are involved in retraining have a problem with the extended time it takes.

Now, a computer-aided instruction system will not immediately solve that problem by itself because you need a mentor with it. The mentor is essential because the learners come into the program thinking their skills are all right. However, they have usually fallen behind what is really required. If you take an individual who is already having trouble with their job, and you put them through retraining and they fail that, then we all have to deal with the problem in society.

Motorola and other firms are dealing in the worldwide marketplace today. Other countries beyond our borders are finding ways to accelerate the education and training of their people. I think we need to do it better here.

Having access to the technology that is already developed within the Government makes a lot of sense to us. An improved partnership between the Government, the private sector, and trade associations should result in a "win-win" for all.

We have several suggestions that we think will enhance the usefulness of this bill.

First would be to broaden out the transfer of technology to not only small businesses but businesses of all sizes, to trade associations, State and local government, which is included, and labor organizations.

If you, look at the historic trend of technology, it is not always the original developer that is first able to take a new concept or product and successfully apply it. Sometimes there need to be intermediate steps. Frequently, a larger organization with more resources and experience repackages it, and applies it. And then there is an applied technology learning process that goes on for the benefit of all.

In summary, our first point is we would like to see the bill broadened out so more organizations could use technology that is developed with taxpayers' money.

Second, we think the linkage between the technology and the user ought to be fairly direct. We perceive that the potential users should be able to talk to the developers directly. That is in contrast to a library system where the users or the source agency develops it, writes it up and puts it in a library and then someone else extracts it. We think that is too long a process.

We think whatever organization is provided as the vehicle to transfer the technology should put the source agency development personnel together with the private users, foundations, trade associations, and others.

Our third point is that we believe there is a vehicle already present within the Federal Government to do that in the Department of Commerce. NTIS, the National Technical Information Service within Commerce was created in approximately in 1970 to transfer information out of Government to the private sector. I have personally used their service. It works very well. We are able to get technical papers, documents and so on. But what I wanted to do through NTIS on a personal basis at Motorola, which is difficult to do, is to talk directly to the developer on whatever the technology is.

We think the NTIS in an expanded role could facilitate that. That could be particularly significant to small business organizations who do not have the resources to hire outside consultants, researchers, and so on to work with the Government people to transfer the technology. We think a face-to-face, one-on-one approach between the user and the source agency could be very beneficial.

The Stevenson-Waggonner Act, of 1980 addresses that question. It provides for licensing, personnel exchanges and a number of other vehicles to transfer technology.

We think an expanded NTIS role could perform that function well.

We do realize that when a source agency is required to transfer technology there could be additional burdens in time or money on them. The act needs to address the question of how that transfer could be funded.

Now, there are times, I think through NASA and others, where an outside or non-Government entity uses technology and pays a licensing fee for it. That could be the case where you have a well-defined body of technology that needs to be transferred.

There may be some portions of technology, computer software and others that need customizing for a broad range of uses. And in that instance, NTIS, if you accept this concept, may want to go and fund it so that many different organizations could use it. In effect, they would put seed money into it.

In conclusion, we think the concept is right on, it is perfect for what we are trying to address. We think it could be broadened out to include more users.

We would like to see a direct linkage between the source agency and the users. The American Society for Training and Development and Motorola and not doubt others would be interested in participating and helping evolve this concept, because it is necessary for us individually and for the country's economic health as a whole.

[The prepared statement of Mr. Robinson and additional material supplied by him follows:]

STATEMENT OF JOHN ROBINSON

MANAGER OF INSTRUCTIONAL RESOURCES
MOTOROLA TRAINING CENTER

ON BEHALF OF THE
AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT REGARDING

S. 2561

THE TRAINING AND TECHNOLOGY TRANSFER ACT OF 1984

BEFORE THE

SENATE SUBCOMMITTEE ON EDUCATION, ARTS AND HUMANITIES

ROBERT T. STAFFORD, CHAIRMAN

JUNE 28, 1984

GOOD DAY, MR CHAIRMAN AND MEMBERS OF THE COMMITTEE. MY NAME IS JOHN ROBINSON. I AM MANAGER OF INSTRUCTIONAL RESOURCES AT THE MOTOROLA TRAINING CENTER IN SCHAUMBERG, ILLINOIS AND I AM HERE TODAY TO TESTIFY ON BEHALF OF THE AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT. THE SOCIETY HAS SOME 50,000 MEMBERS WHO REPRESENT EMPLOYER-PROVIDED EDUCATION AND TRAINING. THE SINGLE LARGEST FORCE TODAY IN THE RETRAINING OF AMERICA'S WORKFORCE. WE HAVE A VITAL INTEREST IN THE EFFICIENCY WITH WHICH OUR EMPLOYEES ACQUIRE THE NEW KNOWLEDGE AND SKILLS THEY NEED TO KEEP OUR NATION COMPETITIVE.

FIRST, WE WANT TO EXPRESS ENTHUSIASM FOR WHAT THE TRAINING TECHNOLOGY TRANSFER ACT REPRESENTS. WE URGENTLY NEED GREATER COOPERATION AND COMMUNICATION AMONG GOVERNMENT, EDUCATION AND THE WORKPLACE ON MATTERS WHICH RELATE TO DEVELOPING THE NATION'S HUMAN RESOURCES. BUILDING THE QUALITY OF OUR WORK FORCE IS CRITICAL TO NATIONAL ECONOMIC HEALTH.

WHILE WE ARE STRONGLY IN FAVOR OF THE BILL'S INTENT, WE WOULD MAKE SEVERAL SUGGESTIONS WHICH WE BELIEVE WILL MAKE IT MORE USEFUL.

FIRST, THE TRANSFER OF TRAINING TECHNOLOGY SHOULD NOT BE LIMITED TO SMALL BUSINESS, EDUCATIONAL INSTITUTIONS OR STATE AND LOCAL GOVERNMENTS. TAX SUPPORTED R&D AND INNOVATION BEST SERVES THE OVERALL NEEDS OF THE NATION IF IT ENCOMPASSES THE NATIONAL ECONOMIC COMMUNITY AS A WHOLE.

MUCH OF THE TRAINING TECHNOLOGY DEVELOPED BY THE DEPARTMENT OF DEFENSE IS PROBABLY BEST SUITED TO MODEST OR LARGE SIZE ORGANIZATIONS. THESE ORGANIZATIONS HAVE ECONOMIC AND TECHNOLOGICAL CAPABILITIES COMMENSURATE WITH THE DEPARTMENT OF DEFENSE. UNFORTUNATELY, SMALL BUSINESSES OFTEN DO NOT HAVE SUFFICIENT NUMBERS OF EMPLOYEES OR CANNOT JUSTIFY EXTENSIVE INVESTMENTS IN EMPLOYEE TRAINING. MOST EMPLOYEE TRAINING DONE IN SMALL FIRMS IS MODELLED AFTER WHAT HAS BEEN DONE FIRST IN LARGER FIRMS. TRAINING IN SMALL FIRMS MAY BE EFFECTIVELY ENCOURAGED BY SUCCESSFUL APPLICATIONS OF THESE NEW TECHNOLOGIES IN LARGER ORGANIZATIONS.

SECOND, LINKAGES IN TRANSFERS OF TRAINING TECHNOLOGY SHOULD BE DIRECT AND EFFICIENT. THE DEPARTMENT OF DEFENSE IS IN THE BEST POSITION TO MAINTAIN A USEFUL INVENTORY OF WHAT IT HAS AND TO KEEP IT UP TO DATE. IT IS ALSO IN THE BEST POSITION TO ADVISE OTHERS ON HOW TO USE SOPHISTICATED TRAINING TECHNOLOGY IT HAS DEVELOPED.

WE ADVOCATE THE SAME PRINCIPLE WHEN USING OTHER FEDERAL AGENCIES AS SOURCES FOR TRANSFER OF TRAINING TECHNOLOGY, NAMELY THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, THE NATIONAL INSTITUTES OF HEALTH AND SO ON. WE BELIEVE THAT EFFECTIVE TRANSFER IS GREATLY ENHANCED BY DIRECT LINKAGE.

YET, THERE CERTAINLY IS A CASE FOR CENTRALIZED INFORMATION COLLECTION AND DISSEMINATION.

ACTUALLY, THE DEPARTMENT OF COMMERCE IS ALREADY SET UP, UNDER THE STEVENSON-WYDLER TECHNOLOGY INNOVATION ACT OF 1980, TO TRANSFER TECHNOLOGY, INCLUDING TRAINING TECHNOLOGY. THE DEPARTMENT IS NOW CHARGED WITH THE UTILIZATION OF FEDERALLY-FUNDED TECHNOLOGY DEVELOPMENTS, INCLUDING WORKING WITH SMALL BUSINESSES, COLLECTION AND DISSEMINATION OF INFORMATION, LICENSING AND OTHER HANDLING OF INTELLECTUAL PROPERTY, WORKING WITH COLLEGES AND UNIVERSITIES, AND FOSTERING OF PERSONNEL EXCHANGE AMONG GOVERNMENT, ACADEMIA AND INDUSTRY. IT APPEARS THAT THE DEPARTMENT OF COMMERCE NATIONAL TECHNICAL INFORMATION SERVICE COULD USE ITS EXISTING MECHANISMS TO PROVIDE THE FUNCTIONS OF THE OFFICE OF TRAINING TECHNOLOGY TRANSFER.

SUCH AN OFFICE COULD BE FUNDED FOR AN EXPANDED ROLE IN TRANSFERING GOVERNMENT TRAINING TECHNOLOGY TO THE PRIVATE SECTOR. THE FUNDING COULD BE EFFECTIVELY UTILIZED FOR:

1. BUILDING A MORE COMPREHENSIVE INVENTORY OF GOVERNMENT-DEVELOPED TRANING TECHNOLOGY WITH A PARTICULAR EMPHASIS ON INFORMATION THAT WOULD ENABLE POTENTIAL PRIVATE SECTORS TO EVALUATE THE APPLICABILITY OF THE TRAINING RESOURCE TO THEIR OWN NEEDS.

2. DEVELOPING AN ACTIVE PROGRAM OF OUTREACH TO SMALL BUSINESS, EDUCATIONAL INSTITUTIONS, AND BUSINESS AND INDUSTRY TO ENCOURAGE APPLICATIONS OF NEWER TRAINING METHODS IN EMPLOYEE DEVELOPMENT AND OCCUPATIONAL EDUCATION. THESE EFFORTS MIGHT INCLUDE ORIENTATION SEMINARS AND OTHER LEARNING EXPERIENCES FOR POTENTIAL USERS. THESE FORUMS COULD BE HELD IN COLLABORATION WITH THE DEVELOPMENT SOURCE AGENCIES (E.G., DOD) AND OTHER FACILITATING INTERESTS SUCH AS TRADE AND PROFESSIONAL ASSOCIATIONS. THE AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT WOULD BE MOST PLEASED TO EXPLORE JOINT EFFORTS TO INTRODUCE GOVERNMENT-DEVELOPED TRAINING TECHNOLOGY TO ITS FIELD OF EMPLOYEE TRAINING AND DEVELOPMENT.

3. ASSISTANCE TO SOURCE AGENCIES SUCH AS THE DEPARTMENT OF DEFENSE, IN BRINGING THEIR KNOW-HOW TO BEAR IN HELPING POTENTIAL USERS MAKE EFFECTIVE TRANSFERS. THESE FUNDS COULD BE CHANNELLED

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THROUGH NTIS. IT COULD SERVE AS THE PRIMARY SOURCE OF INFORMATION AND CONTACT FOR POTENTIAL USERS. USING SOURCE AGENCIES IN THIS MANNER WOULD TEND TO BRING THE MOST RELEVANT EXPERTISE AND HIGH RELIABILITY TO THE TRANSFERS. IT WOULD ALSO KEEP THE SOURCE AGENCIES MORE INVOLVED IN THE PROGRAMS AND UP TO DATE WITH INFORMATION ABOUT ITS TRAINING TECHNOLOGIES.

THE TRANSFER PROGRAM SPECIFICALLY SHOULD ENCOURAGE PRIVATE SECTOR ENTREPRENEURS, SUCH AS THE COMMERCIAL PUBLISHERS AND ORGANIZATIONS IN WHAT WE HAVE COME TO CALL THE "TRAINING INDUSTRY" TO HELP TRANSFER TRAINING ADVANCES FROM GOVERNMENT TO THE PRIVATE SECTOR. ENTREPRENEURS WHO MAKE ADAPTATIONS OF GOVERNMENT TRAINING MATERIALS OR PROGRAMS SHOULD BE ALLOWED TO PROTECT THAT NEW WORK AS PROPRIETARY IN ORDER TO ENCOURAGE INVESTMENT IN PRODUCT DEVELOPMENT AND DISTRIBUTION. THESE ORGANIZATIONS HAVE EXTENSIVE PRACTICAL EXPERIENCE IN ACQUIRING, PRODUCING AND DISTRIBUTING EDUCATION AND TRAINING MATERIALS AND SERVICES. THEY REPRESENT A POTENTIAL MEANS OF EFFICIENTLY ACHIEVING SOME OF THE PURPOSES OF THIS PROPOSED LEGISLATION.

WE WHOLEHEARTEDLY SUPPORT THE INTENT OF THIS BILL, AND WE OFFER TO HELP IN ANY WAY WE CAN. WE DO SUGGEST THAT IT MIGHT BE AMENDED A BIT AS I HAVE OUTLINED TO INCREASE THE PROBABILITY OF ACHIEVING ITS FULLEST PURPOSE.

ADVANCED TRAINING TECHNOLOGY HAS A HIGH DEGREE OF SOPHISTICATION, AS DO MOST ADVANCES IN TECHNOLOGY, AND WE BELIEVE THAT THE EXPERTISE ASSOCIATED WITH IT SHOULD BE LINKED AS CLOSELY WITH TRANSFER APPLICATIONS. WE ALSO RECOMMEND THAT THE TRANSFER PROCESS BE DESIGNED TO PROVIDE FOR CAREFUL DEFINITION OF NEEDS OF THE POTENTIAL USERS, SUCH AN APPROACH WILL ENCOURAGE EFFECTIVE UTILIZATION OF NEW TECHNOLOGIES SO EMPLOYEES MAY ACQUIRE NEW OCCUPATIONAL KNOWLEDGE AND SKILLS.

WE ESPECIALLY WANT TO COMMEND THE SPONSORS OF THE BILL FOR THEIR INITIATIVE IN THIS MUCH NEEDED COLLABORATION BETWEEN THE GOVERNMENT AND THE PRIVATE SECTOR.

In terms of new knowledge about brain function, the future is already here!

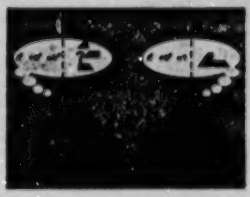
The Creative Brain

BY NED HERRMANN

The word "creativity" is getting as popular today as "productivity" and "efficiency"—and well it should, since in many daily activities it represents the difference between average results and outstanding achievement.

In talking about creativity with many people, I discover that only a few have any specific understanding of it. Most people have only a vague feeling about what creativity is and where it comes from. In my view, the source of creativity is the human brain, particularly that aspect that we refer to as "the mind," but also including those parts of the brain system that are below the cortex and deal with some of our instincts and emotions. New understanding of brain function that has resulted from major breakthroughs occurring in the last 20 years clearly established a differentiated role of the two hemispheres, with emphasis on the cerebral activities, and more recently including the limbic function, which is also hemispheric.

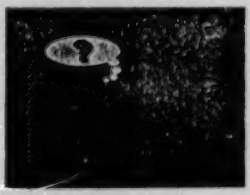
For the great majority of people, the left brain is far better at performing logical, analytic and mathematical tasks, particularly those involving linear and sequential processing. Whereas, in distinct contrast, the right brain is much better at non-verbal ideation, intuition, holistic and synthesizing activities and tasks, particularly those involving spatial, visual and simultaneous processing. In other words, the left brain is great at language, does well at arithmetic, and can plan, schedule and organize events very precisely. The right brain is musical and artistic, sees the "forest" instead of the "trees," helps us drive cars and ski without cracking up, and is amazingly good at hunches and "intuitive" flashes. The evidence developed over the past 10 years supporting this differentiation of function is overwhelming. It has been reported in detail by many authors in prominent journals and books familiar to most people interested in this subject.



I feel that this evidence clearly establishes that dominance is the human condition, and that for most of us, one of the two hemispheres is the dominant one in terms of our preferred mode of processing. This concept of dominance, however, should not be thought of as a dichotomy, but rather as a continuum in which the dominance is distributed in various intensities between the two hemispheres, typically on the basis of a primary and secondary relationship. Therefore, for the majority of individuals within this culture, there would be a brain dominance condition in which the two hemispheres would be working together, but with one clearly taking the lead.

Brain Dominance Examples

During the past five years, my own work has lead to the development of an instrument for measuring brain dominance. This 20-minute paper and pencil instrument can accurately differentiate between a large number of discrete positions along the brain dominance spectrum, ranging from extremely analytic and logical to impressively intuitive and insightful.



Some specific examples of brain dominance may shed further light. For purposes of illustration, I will invent two classically dominant individuals, one with left-brain

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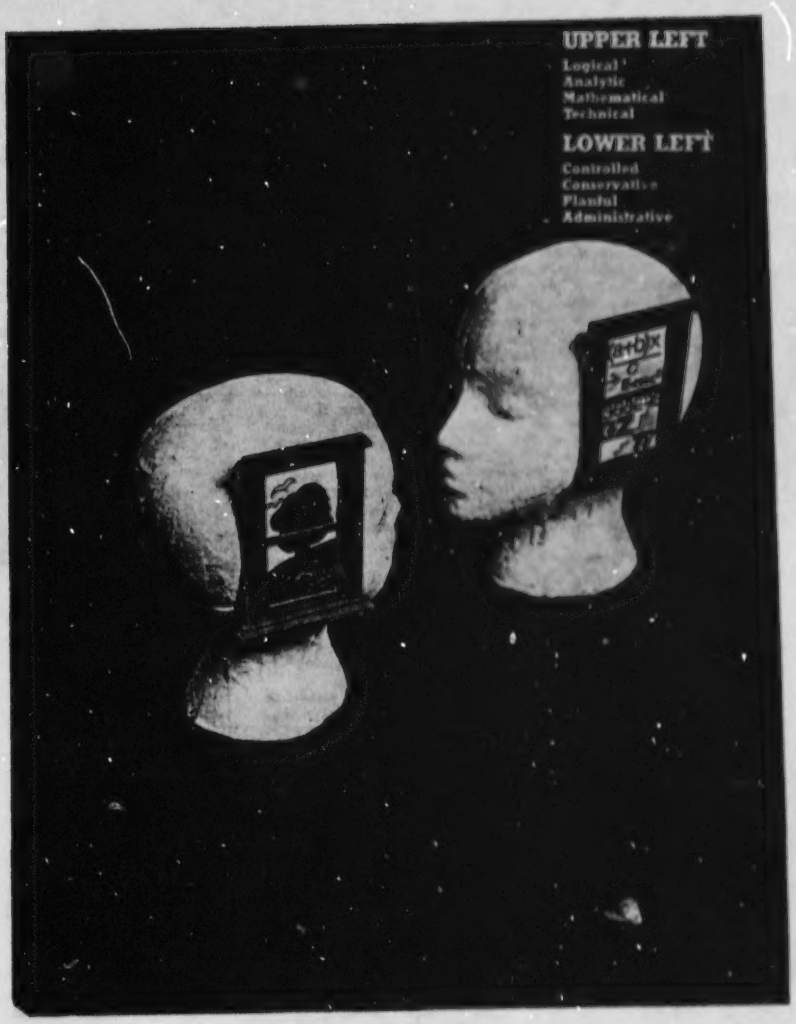

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dominance and one with right-brain dominance. If I give these two stereotypes an algebra problem and a geometry problem to solve I would predict a highly differentiated response. The left-brain dominant individual would typically have no problem with the algebra because of his/her logical, sequential and analytic mental processing, but could have problems with geometry because it is based on spatial relationships which require different processing. On the other hand, the right-brain dominant individual would typically have no problem with geometry, but could have great difficulty with the analytic, sequential processing required for algebra.

Another example is the different mental strategies that are involved in this differentiated form of thinking. For example, take the classic Christmas Eve "toy assembly task." In this example we are dealing with

a bicycle. The right-brain dominant individual would look at the parts and quickly assemble them in his/her mind's eye to be a bicycle. With this holistic view in mind, he/she would typically ignore the instruction book and proceed to assemble the parts in conformance with his/her image. Upon completion he/she would discover seven parts left over; would cram four of them on, and place the remaining three in a bag, hang it around the handlebars and say, "good luck Jimmy." In contrast, the left-brain dominant individual would follow the sequence in the instruction book and connect parts (a), (b) and (c) together with (d) and (e) and so on until the bicycle was assembled. The outcome in both cases is the same, but the strategy, the approach and the mental process is quite different.

Another example is right-brain dominant individuals receiving left-brain directions. These directions appear to be going through their minds without a glancing blow at a stray neuron. These people typically get no useful information out of such an input. However, assuming nominal map-reading skills, if the same people were shown a map they would quickly know where they were and where they needed to go to arrive at their destination.

Here is a personal example: I was involved in an emergency situation at the hospital and was handed the slip which directed me to the Admitting Office. It said, "Turn right; go to the end of the corridor; turn left; turn right; take the elevator one floor up; turn left; turn right; go to the end of the corridor; turn left." Under the emotional circumstances of the emergency, it was extremely difficult to follow those directions and I found myself out a one-way door, back on the street. It would have been enormously helpful to me had the nurse given me a map since I would be able to see quickly where I was and where I needed to go. In point of fact, had she given me both the *sequential* instructions and the *graphic* directions, I would have then had a "whole-brained" instruction which anybody could have accurately interpreted.

As a further example, take the left-brain dominant individual who is attempting to fix the car engine, but can't. However, he/she is capable of passing a written test on how an engine works. In contrast, consider the right-brained youngster who has dropped out of school, who, while leaning against a fence, can diagnose the problem with the car's engine as it travels past 100 feet away. He/she is using a whole array of sensory input and by just observing the car and hearing its engine, is able to accurately diagnose what's wrong. But, of course, he/she can't pass a written test on how an engine works, and probably can't get a job.

Since the understanding of dominance is critical in applying the new knowledge of brain function, I go to some lengths to demonstrate this when I am able to work directly with people in a group situation. In May of this year, I had such an opportunity at a conference called "Brainstreaming: The Art of Whole-Brain Education," sponsored by Syracuse University School of Education. By applying the Herrmann Brain Dominance Instrument, I was able to get data on approximately 35 people who were likely to attend the session. By processing this in advance, I was able to create a continuum of this population and from that select five people from each end of the continuum; thus producing two homogeneous groups, one left-brain dominant and one right-brain dominant.

The demonstration was carried out as follows: I displayed the names

of the people in Group A and Group B on an overhead projector, and called them up to the front of the auditorium. I did not identify which group was of which dominance. I gave both groups the same assignment—"What work turns you on? What are the common characteristics of the work? Reach a group consensus, make a brief report, be back in 15 minutes." The groups were sent to break-out rooms which were identical, with each containing a table and chairs, a flip-chart and felt-pen markers. During the 15-minute interval before their return I teased out of the remaining 150 people in the audience their prediction as to what each group would report and how each group would behave. Precisely at the end of 15 minutes, Group A, the left-brain dominant group, burst into the room, marching in a line with the lead person carrying a flip-chart sheet aloft. They looked triumphant, were smiling and obviously pleased with themselves. I asked them if they had a spokesperson and would that person make a

report. The individual with the flip-chart then made the following report:

Group A (Left-Brain Dominant)
Presentation

- We read the directions and we got to the task immediately.
- We didn't fiddle around, we didn't have any conversation.
- After we made our lists, we had to list them according to their importance.
- We need to know if we did what we were supposed to do.
- The most important thing which we asterisked and "arrowed," is that our work must be multi-faceted.
- We like to be in control.
- We have a high need for success and recognition.
- We like a structured place.
- We have to have closure.
- We are task oriented.
- We like to see results.
- We are always busy doing something constructive.
- We like to make lists.
- We love to cross things off our lists.
- We love an ordered environment.

Following this report, a comment was made by one of the group that they had actually finished in 12 minutes, but were reluctant to come back early so they took the additional two minutes to prioritize the listing of key characteristics contained on their flip-chart. At this point the right-brained group (B) had not returned and so an emissary was dispatched to get them. When they did return, it was approximately 20 minutes after they had been sent to the break-out room. They drifted in individually—one at a time, and proceeded to meld into the audience, and it was only after a lot of encouragement from me that I got them to assemble up at the front of the room. There were no flip-charts, and there was no obvious spokesperson. After some pleading, one of them volunteered the following report:

Group B (Right-Brain Dominant)
Presentation

- First of all, we were confused by the word "work."
- We couldn't make a decision.
- Some people mentioned painting, drawing, gardening and athletics.
- Liking a lot of space.
- Viewing from a whole point of view.
- Seeing the end at the beginning.

Following this report, I asked the Group A people to comment on how they characterized the work that "turned on" the Group B people. Their response was "It seems puzzling to me." The left-brained group then offered gratuitously the comment, "We want you to know that we are glad we are who we are."Then, since the right-brain group had not heard the left-brain report since they had not returned early enough, I asked the left-brain group to recapitulate, and they did so with these key words: Task-oriented, Structured, Closure, Successful, In Control, and Organized.

Whereupon I asked the right-brain group to characterize the work that "turned on" the left-brain group and their response was a simultaneous, unanimous "boring." Now the point of all of this is that people, by reason of the dominance, have different mental processes and different mental preferences, and this affects their choice of work and activities. These differences, which are very striking when demonstrated as I have just done, can be made very useful when individuals are in a situation where they can complement one another by making those differences additive rather than abrasive. Indeed, these differences can occur not only between two groups of people or between two individuals, but also inside an individual's head. By this, I mean that the differentiative capabilities, strategies and preferences of each hemisphere can be made to work effectively together in

a back and forth sequencing, and in an interactive way so as to achieve the whole-brainedness required for tasks and activities that require whole-brain thinking.

Whole-brainedness & Creativity

Since in my view creativity is whole-brained, then one can be more effective in the applied creative thinking sense if the two hemispheres are working together cooperatively and interactively. For example, if you think through a creative process consisting of interest, preparation, incubation, illumination, verification and exploitation, then it becomes clear that the process itself has left-brained, right-brained and whole-brained phases to it. If you started with interest as being the first stage, then I would speculate that would be whole-brained. Preparation is clearly left-brained. That means doing the rigorous task of defining a problem and specifying it in its essence. Incubation, on the other hand, is clearly right-brained. It involves getting away from the problem and engaging in an activity that permits the effortless, natural processes of the right brain to mull over the complexities of the problem, so as to permit the mind to come up with new combinations that could lead to a solution.

The illumination stage is where this kind of "Aha" can occur, which produces one or more possible ideas or potential solutions. The verification stage, then, is the critical left-brain analysis of the idea or potential solution against the specifications of the problem. The final stage could be called "exploitation," which is the putting to use or applying the solution which emerges from the previous stages. Exploitation is probably whole-brained. Thus by making such a left-brained analysis

of the process itself, the whole brainedness of creativity becomes more clear.

If creativity is whole-brained, then I believe that to teach creativity, there must also be a whole-brained approach. New knowledge of brain function, when integrated with sophisticated course design, provides the basis of whole-brain design and delivery. Above and beyond the whole brainedness of creativity as a subject is the issue of the unique brain orientations of participants that might be involved in a workshop on that subject. Therefore the issue is how to reach each person in a way that they will understand in terms of their own experience, and also consistent with the substance of the learning points being taught. One technique to accomplish this is sequencing the teaching across the brain-dominance spectrum for each learning point being taught.

Let me explain further... In any given program, whether it be on creativity, motivation, strategic planning, etc., there are some key learning points that are so substantive to the course or workshop that the teacher would "die" for that point. Perhaps in a week-long seminar, there may be two dozen such points. Let's, for example, take the *Johari Window* concept as a key learning point in a workshop on motivation. The question is how best to deliver that learning point to a group of participants whose brain dominances range across the entire spectrum. I believe the following strategy vastly improves the chances of achieving that goal. The first step in the sequence is to introduce the concept of the Johari Window by drawing a graphic on a flip-chart or chalk board, and unfolding the interrelationships of the matrix, using examples drawn from experience, with the leader using both verbal and nonverbal communication, and role-modeling the dynamics of the different quadrants of the Johari Window.

Step 2 would be a left-brain handout which represented a definition of the Johari Window and, in sequence, a definition of each of the quadrants. After the participants finished reading the handout, Step 3 would take place, which is a question-and-answer session in which each question would be answered in the same mode as it was asked, and then paraphrased in the complementary mode. For example, a left-brained question would get a left-brained answer and a right-brained paraphrase. A right-brained question would get a right-brained answer and a left-brained paraphrase. Specifically,

- *LB Question:* What do you mean, open my #1 box—I don't have a #1 box.

LB Answer: In relation to another person, you do have a #1 box. It is the area of common knowledge and understanding between you and the other person. You both know some facts simultaneously and perhaps consistently. By revealing more facts you will be opening your #1 box.

RB Paraphrase: Graphically draw a large #1 box.

- *RB Question:* Is it OK to let my emotions get involved?

RB Answer: Yes! Go with the flow.

LB Paraphrase: Emotions are as legitimate a part of communications as are facts. It is useful and desirable

to enhance the factual exchange by adding the emotional content—thus providing a more complete communication.

Step 4 is a right-brained experiential step involving homogenous pairs opening up their #1 box through interaction. This is followed by Step 5, which is a debriefing by each pair, using the handout in Step 2 as the basis of a critical analysis of what happens in Step 4. The last step is a question-and-answer session, once again responding in the same mode and paraphrasing in the complementary mode, and also supplementing by the leader testing for understanding by asking for metaphoric responses. A metaphor is one of the best tests of understanding, because in order to translate into a metaphor, the participants must understand the learning point. Without this understanding, the metaphor will "miss by a mile," thus revealing a lack of understanding which can be corrected on the spot by the leader.

This simple sequence scans across the brain-dominance spectrum from right to left to whole, and repeating from right to left to whole. The result is that a heterogeneous group would have a far better chance of understanding the Johari Window concept on a basis not only consistent with their fellow participants, but also consistent with the specific learning points designed into the course. There is a further bonus, and that is that this kind of learning is more interesting, more fun and more rewarding for both the participant and the leader. In my experience, more can be accomplished in a shorter period of time than other strategies with which I am aware.

The Future Is Here

I feel that in terms of many aspects of new knowledge about brain function, the future is already here; that we indeed do know enough to begin to use these new understandings in the design and delivery of learning. I have found that this can be optimized by taking advantage of the willingness of potential participants to volunteer their personal dominance data by filling out the instrument and then, by drawing from a participant pool, assemble them into a composite whole brain, with each discrete point across the brain dominance spectrum represented by one of the participants. This immediately produces an entirely different mix of participants than other approaches to registration. There are multiple functions, multiple occupations, multiple positions. The heterogeneity of the group provides the basis for enrichment of the learning process for all.

In designing a course, seminar or workshop for such a composite whole brain, it's important to understand these caveats which have emerged from my four years of practical experience:

1. A little left brain goes a long way. By this I mean, that the specialized capabilities of the left brain makes it much more "powerful" than the right brain, and it can dominate the individual's thinking processes and thus delimit the opportunity for whole-brain thinking.

2. In influencing brain dominance, it's much easier to bring about a move from left to right than from right to left. By this, I mean that moving from left to right is "liberation," and moving from right to left is "hard work."

3. When moving from left to right, the right brain potential is added without giving up any of the left. This means that all of those great things that the left brain provides can be preserved without any discount, and still get the rich contribution of right-brain thinking.

4. When moving from right to left, the acquisition of left-brain knowledge, facts and skills requires (at least temporary) application of left-brain control and discipline. This says that "going back to school" takes enough determination to override the voices that say, "Oh, no, not again."

5. In influencing dominance, motivation is a key to achieve needed behavior change. People, particularly those trying to move from right to

left, really need to be motivated by the pragmatic goal that the left-brain skills being acquired are going to be very helpful to the person.

I have found that whole-brain design and delivery seem to produce a number of bonus outcomes. In terms of the *Applied Creative Thinking Workshop*, which is the "flagship" in terms of my application, there are a number of significant outcomes that were not specific goals of the learning design. They are:

1. *The legitimatizing of play:* "Play is OK, even for serious folks, like managers."
2. *Personal affirmation:* That special feeling of "feeling good" about yourself, where you are now, what you can do, and where you can go.
3. *A feeling of renewal:* including a renewed interest in self, in the work, and in the possibilities for future growth.

A key question in the area of dominance is the degree to which the dominance condition changes over the course of time. A recent study involving the application of the

Herrmann Brain Dominance Instrument took place at Walter Reed Hospital over a period of one year. The participants in a clinical pastoral residency program were subjected to a very intensive course of instruction during that time. The resulting data show clear evidence that dominance can indeed change, when the activity is powerful enough to bring about a change. While I have no data on a steady state condition, I could speculate that an individual who continues to do the same work in the same circumstances over a period of a year or so would remain relatively stable in terms of their brain dominance characteristics. However, an individual

with a particular brain dominance profile who is involved in a learning experience that has, as its objective, producing change, then the successful outcome of that learning experience would be a measured difference in the brain dominance profiles of the individuals involved.

In the longitudinal study already cited, there were five individuals who started out in brain dominance condition 1, and then over the course of the first six months, progressed to brain dominance condition 2, and then in the final six months, brain dominance 3. The data shows clearly that each person changed dominance during this period—some more so than others, and some in different directions than others. But each unique individual responded in their own unique way to the learning experience.

In a debriefing session with the five people involved, person A, who moved to the left, said: "The course of instruction was taking me into a place where I was more comfortable and so I just continued to stay in that place." Person B said: "The course of instruction was taking me to a place I didn't want to go and I fought back and decided that I needed to be quite different from that direction, and I am pleased to see that I ended up where I wanted to be." Person C said: "I felt a change taking place but it was relatively slow and quite comfortable." Person D said: "I felt like I had visited a strange land and one that I didn't particularly want to live in, and so I returned home." This metaphor was supplemented by person E who said: "Yes, but we learned some interesting recipes in that new land which we have taken back home with us and can use when appropriate."

It was fortuitous that in conjunction with the course of instruction, the leader had arranged for an art therapist to conduct five separate sessions with the individuals, spaced over the duration of the one-year program. When those five pieces of art work were displayed, along with the brain dominance data for each person, the changes or milestones along the journey became quite evident. For example, the first two drawings by person E were quite similar in mode and concept, but the middle drawing, which took place during the transition that person E experienced in moving from a direction toward the left, and then reversing back toward the right, that particular drawing was dramatically different, and indeed showed a ship sailing between a passageway. Perhaps the best data of all comes from the individuals themselves, and it was clear that each one of them felt comfortable with the diagnosis and the final direction that they had taken during the learning experience.

So there is one unmistakable conclusion emerging from this experience: if the training program is good enough to be meaningful in terms of bringing about change in the participants involved, then this in turn will impact on the way that person thinks and this, in turn, will be reflected in their brain dominance characteristics. The ability to measure brain dominance provides the basis for new ways to improve the design and delivery of learning.

Ned Herrmann is Manager, Creative Educational Programs, General Electric Co. Management Development Institute, Croton-On-Hudson, NY.

Senator STAFFORD. Thank you very much, Mr. Robinson.

Senator Pell?

Senator PELL. Thank you very much, Mr. Chairman.

As I understand it, Mr. Robinson, you are speaking here not only for your company, Motorola, but also for your professional association, the American Society for Training and Development; is that correct?

Mr. ROBINSON. Yes.

Senator PELL. Thank you

Do you believe that the private sector is fully utilizing the training technology being developed by the Defense Department? You touched on this in your testimony, but in what percentage or by what order of magnitude do you think that the techniques are being utilized now in private industry?

Mr. ROBINSON. Speaking for Motorola, we are using products that are developed today, products—hardware and software. What we would like to do is have access to training technology. The percentage utilization is small at the present time. For example, the Navy has a very, very effective system for training electronic technicians for the fleet. They have a good training system and they have accumulated an incredible amount of data on the performance of individuals.

When you think about the turnover ratio in the Navy, how often they have to retrain electronics technicians? We think that kind of experience could benefit us. It needs to be customized from the Navy to the private industry.

Senator PELL. I think there are something like 23 million American illiterates at this time. Do you think that this technology can play a role in reducing this problem?

Mr. ROBINSON. It can. We have four programs going in Motorola to retrain minorities. Some of that training has to be in the English language and particularly in mathematics. I do think it has a role.

Our primary emphasis is to accelerate it, to go back to Caroline Cortez and say it should not take someone like Caroline 14 years to get an associate's degree.

I think what the military has done is to bring people up to speed faster and we would like to have access to that technology which does not unduly burden the Government, and lets us use the technology.

Senator PELL. Does not this involve also, the development of more esoteric techniques? You get into this business of the left brain and the right brain and brain transfer. Do you touch upon that?

Mr. ROBINSON. Yes, we have. We have been looking at it, and you have hit upon a very interesting personal area. Because a typical individual who needs to acquire math and science skills is working on learning that area and not aware of some emotional impact upon them. The fear comes out of the right brain. Manufacturers, managers, and supervisors are still in the early stages of understanding the impact of retraining that is going on in the mind of the individual employee. Some would take the perspective, I came up the hard way, you should, too. Others would take the perspec-

tive I came up the hard way, I am going to coach you to succeed a little faster.

I think we need to encourage everybody to realize the impact and the agony some of our fellow citizens and employees are going through. What is going on is not just acquiring the knowledge, it is the emotional impact of being considered really a little bit behind the power curve of getting where you want to be. That is a right brain emotional problem.

Senator PELL. Is it your own view there is a difference between the right brain and the left brain?

Mr. ROBINSON. I am not an expert in that area, but I believe there is a difference. When I have something to do, I try to decide whether it is a right brain function or a left brain function and not let the other side interfere.

Senator PELL. Is it important that both brains work in sync?

Mr. ROBINSON. Absolutely.

Senator PELL. Is any work being done in this regard of which you are aware in either the Pentagon or private industry to try to bring these two areas into synchronization?

Mr. ROBINSON. Yes, there is Ned Herrmann who was with General Electric for many years and is now retired. He has worked actively in the area of brain research, particularly to applied problem-solving. If you have not had an opportunity to talk to Ned, you really ought to look him up. I will see that you get information on it.

Senator PELL. I would be grateful if you let me have his name.

Are you familiar with the work of Mr. Edward Winchester in the Defense Department?

Mr. ROBINSON. No, I am not.

Senator Pell [presiding]. He is doing some important work under the Comptroller General and I hope he receives encouragement.

I thank you very much, indeed, for being with us, Mr. Robinson. And I appreciate your remarks very, very much.

Our next witness is Dr. Edward Liston, president of the Community College of Rhode Island. And we are partners in a variety of projects, whether it is the Portugese Foundation or other projects that are of benefit to our State, including the ill-fated greenhouse project. And we hope sometimes we score successes. But, at any rate, I welcome you very much for being down here, Dr. Liston. Thank you for all the help you give to so many good causes in our State. I am very appreciative of it.

STATEMENT OF DR. EDWARD LISTON, PRESIDENT, COMMUNITY COLLEGE OF RHODE ISLAND, WARWICK, RI

Dr. LISTON. Thank you, Senator.

It is a pleasure to be here but, as you know, it is always difficult to leave Rhode Island in the summertime.

It is a pleasure for me to testify on behalf of the Training Technology Transfer Act because it makes good sense.

For the past 18 years, I have been a community college president in Connecticut, California, and Rhode Island. In addition, I am a member of the Northern Rhode Island Private Industry Council.

S. 2561 has important implications for both commnunity colleges and private industry councils in delivering instructional services throughout the Nation to people who can develop the skills needed to put American back to work. This is a rare opportunity to "repackage" already existing technology and broaden its use in a cost-effective manner. Computer-based training systems have proven to be extraordinarily effective, especially with the adult-learner. We have found at the Community College of Rhode Island, for instance, that many young adults who have been away from school for some time, possibly in the service, were "turned off" by the instruction they received in high school, the formal lecture. They want to be responsible for their own learning, to be active in the learning process, and to proceed at their own rate without being held back or "pushed" by the pace of the group as a whole.

Some of our instructors at CCRI have been employing the concept of "mastery learning" for some time with great success. They theorize that almost anyone can learn anything at a proficiency level if given enough time.

Another attractive feature of computer-based training systems as developed by the Department of Defense is the availability of a modular approach to learning a skill. The learner can "pick and choose" the content he or she needs to be productive in the marketplace.

Although the economy has been improving, there are still significant pockets of "structural" unemployment due to "mismatches" between job requirements and available workers in our States. The Job Training Partnership Act, the community colleges, and other deliverers of instructional services to the unemployed are working very hard to solve this problem.

S. 2561 provides an important weapon in the endless attack that we must mount against ignorance and the hardships that are endured by the unemployed in a time of relative prosperity.

And finally, those of us in the educational "establishment" are always wary of anything that tends to foster more redtape and bureaucracy. S. 2561 appears to offer a sensible structure for the accomplishment of its purpose. The costs are not overwhelming since the software already exists.

My colleagues in the 1,200-plus community, technical and junior colleges across the country joint me in urging your support of this legislation.

Senator PELL. Thank you very much indeed, Dr. Liston, for taking the trouble to come down here. It was a long trip and I appreciate your support more than I can say.

And in that regard, I am aware of the lead that you always played in our State. I wonder if you felt, in view of your 18 years with community colleges, that this bill makes adequate recognition of the role of junior colleges and community colleges?

Dr. LISTON. I think it does, without singling out the community colleges as a specific source of delivery in a set-aside fashion. I think you will find that the community colleges, even with respect to previous testimony, will play a major role in working with the unemployed adults in cooperation with the intent of this bill.

In the State of Rhode Island, for instance, we have one of the highest rates of adult illiteracy in the Nation in terms of the adults

who have not completed a high school education. And so while we are aware of the fact that the demography with respect to numbers of high school students is declining, particularly in the Northeast and more specifically in Rhode Island, we know that the job of educational institutions like community colleges is enormous in taking up the backlog of adults that have not, for one reason or another, had the opportunity to achieve their full potential

So about half the adult population in our State does not as yet have a high school education.

We find as I mentioned here that many of these adults are wary of the formal classroom lecture. They do not feel comfortable with it, they have poor experiences 10, 15, 20 years ago. They like the fact that the technology is available to them. Personal help is also available and that they can proceed at their own rate and some of them surprise themselves. In fact, most of them do and they—we have a tremendous number of success stories.

So I think this technology is the important factor here. No one of our institutions has the funding capabilities of developing or even buying this technology.

Senator PELL. What would be the average age of your students at the community college?

Dr. LISTON. It keeps rising.

As you know, we offer just the first 2 years, but the average age is probably 34, 35 now. It seems to keep rising every year.

Senator PELL. How many of those are full-time students and how many part-time?

Dr. LISTON. By and large at the Community College of Rhode Island we run about 60 percent full-time students, but community colleges throughout the country, particularly in the urban centers, would have a preponderance of part-time working adults that is pretty much the community college population.

Senator PELL. If this bill were enacted, and we cannot have any assurance of that, we can only hope, would you envision that your college would be an applicant for a conversion grant?

Dr. LISTON. Yes, I would. Because I work both sides of the street. I work with my work on the Private Industry Council in Northern Rhode Island and also with the community college. And in a small State like Rhode Island all these agencies interact with each other basically to target in on the job to be done and the job to be done in our view is to raise the literacy level of the entire population as best we can.

Senator PELL. I thank you very much, Dr. Liston, for coming down and I envy your return back to Rhode Island. Thank you so much.

Dr. LISTON. Thank you, Senator

Senator PELL. Now, our next witness is Col. William Scott, USA, from the Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs, and Logistics, Washington, DC.

Colonel, if you would please come forward.

I note with special appreciation that it is Colonel Scott's office that provided the excellent exhibition of training technology in the Russell Building rotunda last fall. I remember that at the time I thought you did a very good job of explaining some of your work.

So I welcome you here and I would add that I am going to have to leave shortly because there is a bill on the Senate floor, so I may have to recess the committee if we have not finished up.

STATEMENT OF COL. WILLIAM SCOTT, USA, OFFICE OF ASSISTANT SECRETARY OF DEFENSE FOR MANPOWER, INSTALLATIONS, AND LOGISTICS, THE PENTAGON, WASHINGTON, DC

Colonel SCOTT. Thank you.

Mr. Chairman, I am Col. William A. Scott, Director, Training and Education, in the Office of the Deputy Assistant Secretary of Defense, Military Personnel and Force Management. I appreciate your invitation to express my views on S. 2561, the Training Technology Transfer Act of 1984.

The Department of Defense generally supports programs to promote the transfer of training technology to the civilian sector. Such programs should:

One, assist potential users of this technology in defining their specific training requirements;

Two, provide resources to those Federal agencies who have developed the new technology and can assist in the transfer process;

Three, provide resources for evaluating the effectiveness of new technology applications in the private sector; and

Four, ensure feedback is given to those Federal agencies who originally developed the technology.

We do not believe, however, that the establishment of a new office would materially improve the transfer of training technology from the Department of Defense to the private sector. This office, as described in the bill, would simply establish another administrative echelon between the Department of Defense as a developer of training technology and potential clients in the civilian sector

Accordingly, the Department of Defense cannot endorse S. 2561.

Thank you, Mr. Chairman, for giving me this opportunity to be a part of these hearings

Senator PELL. Could you repeat that sentence?

The Department of Defense does not endorse the bill in its present form? But it does support and endorse what we are trying to do?

Colonel SCOTT. Yes, sir.

What we said basically is that we support programs of training technology transfer but at this point the bill as structured would only add another echelon between the client and the developer of the technology that would have to be dealt with. And, we are talking specifically about the Department of Defense as a developer of the technology at this point.

Senator PELL. Also, I understand you are thinking of establishing a technology training center in Orlando?

Colonel SCOTT. Yes, sir, we are establishing the training Data and Analysis Center [TDAC] in Orlando.

Senator PELL. Which would be parallel to the structure we are talking about here?

Colonel SCOTT. It is parallel in the sense that we in the Department of Defense are interested in identifying those items of training and educational technology that will help us deliver effective

training in a cost effective manner. Since we are spending somewhere in the neighborhood of 18 billion a year on individual training it is incumbent upon us to be able to do this.

We train 300,000 people a year just to maintain the force of the levels mandated by the Congress.

Senator PELL. Somehow I feel as though there is an invisible but nevertheless steel curtain between the techniques and technology developed by the Defense Department and their availability to the outside industrial world.

What could be done so that, as Mr. Spring and Dr. Liston suggested, your techniques could be made available to them?

Colonel SCOTT. I think what we have to develop sir, are host client relationships. As it now stands under current legislation, Stevenson-Wydler Technology Innovation Act of 1980, there are offices of technology application in each one of our human resource labs, the Army Research Institute, is the Navy Naval Personnel Research and Development Center and the AF Human Resources Laboratory. The Army Research Institute as an example has an ongoing program with Berks County in Pennsylvania. The school district is using the SDMS, the special data management system which is nothing more than a videodisc system developed by the Army for teaching subject matter.

Senator PELL. Would you describe what a videodisc really is?

Colonel SCOTT. Well, I am not an expert in the area, but basically it is a combination of videotape and computerdisc. I guess I could best explain it by providing an example of how it is being used by the Army. The videodisc Interpersonal Training Assessment helps trainees practice soft skills in leadership, counseling and personal problem solving. It is nothing more than a takeoff on an earlier program in which 16-millimeter films were used to show the classic problems that develop between enlisted people and officers. At the end of these short films you were asked the question: What would you do in this situation?

With interactive videodisc we have an opportunity to do the same kind of things. But now the individual gets immediate feedback, he has a joy stick and four buttons that allows him to set up the various scenarios and situations and immediately gives feedback on what he has done and possibly what he could have done. At the same time the instructor is able to keep track of his responses because it is all built into videodisc software package.

Senator PELL. Sort of like an intellectual biofeedback machine.

Colonel SCOTT. Exactly.

Senator PELL I am aware of some of the work that is being done on a classified basis in training, in the Defense Department.

Returning to my question, how could we make this work that is being done on a classified basis become declassified and available to industry?

Colonel SCOTT. Senator, first, I think that the types of materials that we are talking about, the interactive videodisc technology that we are developing, is not classified.

Senator PELL. There are other programs that you have?

Colonel SCOTT. And the truth of the matter is I cannot even comment on those because I am not even familiar with what is happening—in say the intelligence community. I am familar with what is

happening in the education community and the training community.

I think that what is needed is the development of joint partnership between DOD and interested clients. These joint ventures would need some form of resourcing.

Senator PELL. Yes; thank you very much, Col. Scott, for being with us. And if we have any more questions we may come back to you.

Thank you for being with us.

Colonel SCOTT. Thank you, Senator.

Senator PELL. Now, our next witness is Dr. D. Bruce Merrifield, Assistant Secretary of Commerce for Productivity, Technology and Innovation, Department of Commerce. Well, he is not here yet.

Then we have Mr. Rockley Miller, editor and publisher of the Videodisc Monitor, Falls Church, VA, and maybe he could answer that question I put to Colonel Scott.

What is a videodisc?

STATEMENT OF ROCKLEY MILLER, EDITOR AND PUBLISHER, THE VIDEODISC MONITOR, FALLS CHURCH, VA

Mr. MILLER. Good morning, Senator Pell. I think I can tackle that one.

I have been writing about this industry for over 4 years and tracking it for 8. And right now it is a fascinating time in the industry.

The videodisc itself is a new technology——

Senator PELL. Could you pull that mike a little closer to your mouth? Thank you.

Mr. MILLER. The videodisc itself is a new technology that has only been under development for really 20, 30, 40 years but it has recently been introduced in 1979. It is to videotape what an LP album is to an audio cassette. It seems like a fairly small difference but the impact is enormous because it allows rapid access to any portion of the information, whereas it takes a matter of minutes, 5, 10 minutes even to wind through a normal videotape. It is that capability of rapid random access to anywhere within up to an hour of information on a side within a matter of seconds that opens up all of the other possibilities that have been mentioned. It allows interactive control of video material and frees us from the bonds of linear presentations.

I appreciate the opportunity to speak on this bill and I would like to begin by seconding your earlier remarks as stated in the Congressional Record when you introduced the bill, that the cost in establishing and developing the videodisc and interactive videodisc technology is indeed high. In fact, right now in private industry only a handful of major companies such as IBM, General Motors, Ford, and Digital Equipment Corp. have been able to unilaterally establish and initiate large training networks that capitalize on the advantages of these systems.

The situation persists in spite of reports, as we have already heard from prior witnesses, that these technologies are extremely effective. Digital Equipment Corp. has reported that they are experiencing 23 to 46 percent reductions in training time required to

accomplish the same level of expertise and they are projecting a related savings of approximately $100 million over the next 3 years in using this technology as opposed to their prior methods.

Digital education psychologists have also verified that the students have better learning retention, faster learning, improved repair quality when they are training them on technical skills, and better overall student receptivity to the training technology.

The U.S. Army Air Defense School has reported similar reductions of up to 50 percent in the time required to achieve mastery in technical skills. The State of Florida Department of Health and Rehabilitative Services has experienced increased performance, while reductions in training time of up to 25 percent.

The question does not seem to be the effectiveness of the technology.

So given those results, it is not difficult to understand why educational institutions and small businesses are anxious to employ these technologies within their own organizations. Unfortunately, since being first introduced to the market in 1979, the videodisc industry has suffered from a chicken and egg situation. Few software developers have been able to justify the large expense of developing general training or educational programs for a limited hardware population. And few companies have been able to justify the purchase of hardware for which little or no relevant programing exists.

Some of the most extensive development efforts have taken place within the Government and, indeed, in the Department of Defense is where the bulk of early development efforts have taken place.

As you have noted, the transfer of this technology—specifically out of the Department of Defense but in the future out of other agencies of the Government—will enjoy a great multiplier effect broadening the use of technologies that have already been funded.

I submit that a far greater multiplier effect may lie in the Government's contribution to solving the chicken and egg dilemma and that a growing quantity of Government training programs that might become available to private industry could prove catalytic in spurring greater development within the private sector.

If that proves to be the case, I feel that the return on investment from this type of legislation would be immeasurable.

I have three observations on the bill as it is currently written. One of the greatest wastes in the process of technical evolution lies in the duplication of effort. And we have a number of different groups throughout this industry that are continually trying to reinvent the same wheels.

I feel it is an information problem and I feel that one of the greatest advantages of the bill as it is currently written lies in its cataloging provision. This may serve to prevent duplication. This aspect alone may return the original allocation by providing greater coordination between Government agencies, not to mention the service that it would be to private industry.

Few branches within the military, much less the different agencies, are truly at this point cooperating or really even know what is going on in the the other areas. One of the major programs known as electronic information delivery systems, which is currently under way in the Army, is attempting to establish standards for

training systems throughout the military. These emerging standards may have a greater impact on private industry than they will actually have on the military as potential vendors strive for compatibility of their system.

I therefore recommend that the bill be broadened to include within the inventory of these technologies any emerging standards that are coming into play at any point in the Government so that those standards may also be coordinated.

No. 2, the line between training technology and information technology is very hazy and becoming hazier every day. Indeed, training could be characterized as the effective delivery or transfer of information. Much of the software currently being developed by the Government serves a dual purpose: It is both training, and it is also information delivery and the hardware and the technologies necessary to support either, are very compatible.

The Library of Congress just picked up such a system, that is primarily for information delivery. But the same technology could be modified for training. In fact, right now in England they have just begun the use of videodisc and computer technology in their manpower services job centers to deliver information to people that are unemployed. And it can also be used to help educate them on what their opportunities may be. A fine question is whether that is information or whether that it is actually training.

I, therefore, recommend that your term-training technology and your definition within the bill be broadened to include technology that not only trains but informs employees or the public. And that the list of various programs such as your computer-based instructional programs be amended or at least broadened to include informational programs in this section.

And third, many of the companies and agencies have evaluated and reported on the result of the use of the training technology, but most of these studies to date have been very limited in scope, rather narrow in perspective, and small in size.

The greatest number of evaluations have been conducted within the military but these have not been inventoried, or coordinated, or made available to the outside in a comprehensive manner that could provide an information base to further support and promote the use of such technology.

Such an evolving information base would be an invaluable assistance to those companies and institutions that are evaluating either the transfer of specific programs or are evaluating embarking on their own development effort.

I, therefore, recommend that the inventory that you have itemized in this bill be expanded to include any study results, evaluations, and comparative analyses relative to the training technologies. And I also recommend that any small business, institution, association or consortium that benefits or uses or transfers any of these technologies be required to give back to the system a study and a report on its effectiveness. And in that way make a contribution themselves to that base of information.

In conclusion, I would like to say that increasingly rapid technological advancement is continuing to place educational and training burdens upon our society. Too often, we overlook the fact that

the same technologies credited with creating these burdens can be used to relieve them as well.

The job of educating our citizens and training our work force is spilling over the traditional boundaries of school systems, private industry, and Government. A new level of cooperation between these three sectors is required to fully exploit these technologies.

This act, the Training Technology Transfer Act of 1984, I feel, represents a very positive step toward such cooperation.

Thank you.

[The prepared statement of Mr. Miller with attachments follow:]

TESTIMONY BEFORE THE SENATE SUBCOMMITTEE
ON EDUCATION, ARTS, AND HUMANITIES

RE: S.2561 -- TRAINING TECHNOLOGY TRANSFER ACT OF 1984
June 28, 1984

GIVEN BY: Rockley L. Miller, Editor and Publisher
The Videodisc Monitor

Good morning Senator Pell, Senator Stafford, and other distinguished members of this subcommittee. Thank you for the opportunity to speak on behalf of the Training Technology Transfer Act of 1984.

Let me begin by seconding Senator Pell's remarks as noted in the Congressional Record (April 11, 1984) as a preface to his introduction of this bill. The cost of developing and implementing effective computer and videodisc training technologies is indeed high. Within private industry only a handful of major companies, such as IBM, General Motors, Ford, and Digital Equipment Corporation, have been able to unilaterally initiate large training networks that capitalize on the advantages of such systems.

This situation persists in spite of reports of substantial increases in training effectiveness achieved by such systems. For instance, Digital Equipment Corporation has found that satisfactory technical skill levels can be achieved in 23 to 46 percent less time through the use of interactive videodisc instruction,

with related savings of almost $100 million in training expenses projected over the next three years. Digital educational psychologists also have verified that the use of this technology results in better learning retention, faster learning, improved repair quality, and better overall student receptivity.

The US Army Air Defense School has reported similar reductions of up to 30 percent in the time required to achieve mastery in certain technical skills. The State of Florida Department of Health and Rehabilitative Services has also experienced increased performance using interactive videodisc-based training systems while reducing training time requirements by 25 percent. (See attachments on each of these reports).

Given these results, it is not difficult to understand why educational institutions and small business are anxious to employ these technologies within their own organizations. Unfortunately, since entering the market in 1979, the videodisc industry has suffered from a "chicken-and-egg" situation. Few software developers have been able to justify the expense of developing general training or educational programs for

a limited hardware population -- and few companies have been able to justify the purchase of hardware for which little or no relevant programming exists.

Some of the most extensive training technology development efforts to date have taken place within various government agencies, mostly the Department of Defense. As you have noted, Senator Pell, the transfer of this existing programming from the government to the private sector would be subject to a substantial multiplier effect as greater and broader returns are obtained on investments already made by the government in terms of greater employability and productivity of US workers. I submit that a far greater multiplier may lie in the government's contribution to solving the chicken-and-egg dilemma. The availability of a growing quantity of government training programs may well prove catalytic to the greater development of such programs within the private industrial and educational sectors. If that proves to be the case, the return on the government investment will be immeasurable.

GENERAL OBSERVATIONS AND RECOMMENDATIONS

I. One of the greatest wastes in the process of technical evolution lies in the duplication of effort. Different groups, working in isolation, continue to reinvent the same wheels. This is an information problem, and I feel that one of the greatest potential values of this bill lies in its cataloging provisions which may serve to prevent such duplication of effort. This aspect alone may more than return the original allocation by providing for the coordination of training technologies within the various branches of the government, not to mention its service to private industry.

Few branches within the military, much less different government agencies, have knowledge of or cooperation with training programs outside their own spheres. One major program, known as the Electronic Information Delivery System (EIDS) program, is underway in the Army in an attempt to establish standards for such a system throughout the armed forces. Emerging standards may well have a greater impact on private industry than on the military, as potential vendors strive for compatibility.

Recommendation: Section 5.(a) of the bill be broadened to include within the inventory any emerging training technology standards adopted by the government.

II. The line between "training technology" and "information technology" is very hazy. Indeed, "training" can be characterized as the effective delivery or transfer of information. Much of the software currently being developed by the government, such as for the EIDS project above or the Joint Optical Information Network (3,000+ systems in military recruiting offices), serves a dual purpose of training and information dissemination. Other systems, such as the Optical Disk Pilot Project, just opened at the Library of Congress, have been designed for information handling but could easily be applied or modified for training.

Recommendation: The definition of the term "training technology" in Section 3. (13) be broadened to read: ". . . computer software which is developed by a Federal agency to train or inform employees or the public and which may be transferred or converted for use by a non-Federal entity, and includes computer-based instructional and informational programs, interactive videodisc systems . . ."

III. Many companies and agencies have evaluated and reported on the results of their use of training technologies. However, most studies to date have been limited in scope, narrow in perspective, and small in size. The greatest number of evaluations have been conducted within the military, but have not been inventoried or coordinated in any comprehensive manner that might provide an information base to further support and promote the use of such technologies. Such an evolving information base would be of invaluable assistance to those companies and institutions evaluating the transfer of specific programs or embarking on their own development efforts.

Recommendation: (1) The inventory itemized in Section 5.(a)(1) be expanded to include any study results, evaluations, comparative analyses, etc. that relate to the training technologies; and (2) that any small business, institution, association, or consortium benefitting from the use of converted technologies transferred from the government be required to conduct an evaluation of the effectiveness of those technologies and submit a copy of that evaluation to the Director for inclusion in the inventory.

CONCLUSION

Increasingly rapid technological advancement continues to place educational and training burdens upon our society. Too often we overlook the fact that the same technologies credited with creating these burdens can be used to relieve them as well. The job of educating our citizens and training our work force is spilling over the traditional boundaries of school systems, private industry, and government. A new level of cooperation between these three sectors is required to fully exploit the potential of training technologies. The Training Technology Transfer Act of 1984 represents a positive step toward such cooperation.

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ATTACHMENTS

Related Articles from

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Reality and Results

The Second SALT Conference on Interactive Instruction Delivery

Orlando, Florida is not the worst place to be in the middle of February. Five hundred participants, over 30 presenters, and 34 exhibitors found central Florida very accommodating. **The Society of Applied Learning Technology (SALT)**, sponsor of this annual conference, did its usual outstanding job of assembling the right people in the right place at the right time. The weather wasn't bad, either.

Videodisc technology dominated the event. The number of participants and the scope of the projects here demonstrated the disc's acceptance as a viable and valuable tool in instruction delivery. Space allows us to present only highlights of this valuable conference, but entire proceedings will be published *(Ellen Fox, SALT, 703/347-0055)*.

In the keynote address, **John Henry Martin** (president, **JHM Corporation**) described his program for teaching reading and writing at the kindergarten level. His system (licensed by IBM and currently being tested in three cities) uses IBM PC-based lessons, selectric typewriters, and other peripheral reinforcing activities to allow children to discover their ability to translate anything spoken into written words. The system stresses interaction and creative expression; correct grammar and spelling come in due time. The ability to read what is written is a secondary and natural result of the writing process.

Martin said that traditional reading education inhibits children's progress by forcing them to operate at levels beneath those at which they are already communicating. His course requires only one hour of the pre-school day; fifteen minutes is spent on the computer, with the balance spent on a typewriter or in related activities, such as building words with clay. Martin asserts that the typewriter is "the single most powerful educational tool to be ignored for one hundred years." His course takes advantage of a child's instinctive desire to make sense of things by looking for natural structures. The approach seems to work—many of his pre-schoolers now read and write at third grade levels.

IBM intends to make the course available after the current two-year test ends. The entire course and necessary hardware would only cost about $60 per child per year. Martin observed that the industrial revolution seems to have missed the schools, and said, "It is a failure of the institutions to use the technology, not of the technology to be used."

C. Stan Jarvis (president, **ISW**) and **Shinzoh Takizawa** (director, **IMD Company Ltd.**, Japan) discussed the Japanese market for interactive systems and its potential impact on public education. Japan's economic growth has closely paralleled its increases in quality of public education, and America ignores the needs of its classrooms at the peril of the future of its industrial economy, Jarvis said. Parents and employers demand educational performance by the schools, and if satisfaction cannot be found within the traditional system, it will be found elsewhere.

He raised three issues that must be addressed for instructional technology to penetrate the schools: professional esteem of teachers who need incentives to make the technology successful; instructional compatibility of systems; and economics. "We cannot look to the military to set standards or demonstrate economic incentives that can be transferred to the schools," Jarvis said. The military is primarily oriented to individual training, while schools are group oriented; also, military economics can demonstrate cost savings, whereas the use of technology in schools can only increase costs. Therefore, the technology has to be inexpensive, as well as providing justifiable integrity and quality. Japan is now leading the way in such low-cost systems *(801/254-4014)*.

Takizawa described the direction that interactive videodisc systems are taking in Japan. His firm is a joint venture between JVC and TESCO—the world's largest distributor of interactive videodisc hardware in both the laser disc and VHD formats, and a firm long involved in using technology to teach English in Japan. One of the biggest problems for the Japanese in learning English has been the lack of native speakers with which to practice verbal skills. TESCO has used interactive tape machines for this purpose and is now marketing interactive discs. The first disc program was produced by Time-Life and includes four discs, marketed in conjunction with a Pioneer LD-200 laser disc player (available only in Japan). IMD will market educational programs and hardware in the VHD format, and will offer a system consisting of the player, MSX microcomputer, video overlay system, and RGB monitor for under $2,000, with this price expected to drop significantly over the next years. IMD is committed to raise the level of interactive systems while lowering the prices to make the technology more accessible, Takizawa said.

Dennis Williams and **Ed Schwartz** (**University of Delaware**) demonstrated the first of four discs developed under a grant from the National Endowment for the Humanities. Providing generic support material for music instruction, the disc is adaptable, supports learning, and can teach a variety of topics within the given subject area. To provide the greatest flexibility, the disc has been packaged for Level One use with indexes, chapters and picture stops, but it is easily adapted for Level Three interaction. To support the user, this disc comes with a detailed resource guide for the teacher with course ideas, a bibliography, and other helpful materials. A second disc in the series has been completed and is now being pressed *(302/451-2645)*.

William Stembler (**Computer Science Corporation**) discussed his firm's approach to automating the disc production process. He emphasized the need for an automated production management system when dealing with large volumes of still frame information. In its training system for the Patriot missile weapons system, CSC used its computer system to schedule the shooting of 328,000 frames and to control the editing of the disc.

Paul Stiehs (**HumRRO**) discussed his group's experience using spatial data management techniques to provide easy access to information on videodiscs for basic skills training in the military. He said that a primary goal of HumRRO's 14 discs has been to encourage students to take an active part in their own training. Some of the materials developed for the Army are being tested in a pilot project in the intermediate school system in Burkes County, Pennsylvania, to determine if the material can be transferred for slow learners *(703/549-3611)*.

Tom Held (president, **Metamedia**) discussed the development of InfoSource, an interactive disc-based point-of-purchase terminal, for Allegheny International. Metamedia designed the system to meet the needs of customers, who want easy and rapid access to product information and demonstrations; store managers, who want a foolproof system that collects customer demographics; and corporate managers, who want inexpensive delivery in large quantities. InfoSource uses two infrared touch screens, a Sony videodisc player, an IBM PC, and a printer for market demographics and analysis at the end of each day.

To serve other needs beside those of the customer, the first disc includes several hidden program areas which can be accessed for corporate or store manager information. The unit is self-booting, with only one switch for startup. In its current configuration, InfoSource requires the manager to enter the time and date, but Held acknowledged that a time/date card can be added *(301/428-9160)*.

Leslie May (**Digital Equipment Corporation**) shared the results of studies which lead to Digital's increased commitment to the Interactive Video Information System *(see The Videodisc Monitor, March 1984 issue)*. In using IVIS to teach operation and maintenance of company products, Digital found that 23 to 46 percent less time was required than comparable self-paced instruction (SPI); students trained on IVIS achieved equal skill levels as hands-on SPI trained students; and students had a very positive opinion of IVIS as a training system, with the IVIS courses perceived as more stimulating and motivating than traditional lecture/lab and SPI courses.

On the basis of these findings, Digital's Field Service training organization plans to use IVIS as its primary educational delivery system. By 1987, three-quarters of all service training will be via IVIS, with 515 localized Education Information Centers (EIC) in operation throughout the world. Expected benefits include improved quality of training, convenience of retraining and review training, and significantly decreased training costs due to reductions in time, travel, expenses, and need for lab equipment. Expected savings will approach $40 million per year by 1987 *(617/276-4093)*.

On transferring interactive technologies among the military, industrial and educational sectors, **Harvey Long** (**IBM**) observed that such transfer requires government, business, and education to work together. Long sees the transfer of technology to education as a great opportunity for business—but emphasized that it must be approached in a very businesslike way in order to succeed *(305/998-2000)*.

J. Dexter Fletcher (**University of Oregon**) observed that caution must be exercised with new teaching technologies, lest one designs the teaching package to fit the device. He also noted the difficulty of organizing schools to take advantage of new technology *(503/686-3405)*.

Robert Seidel (**Army Research Institute**) saw the transfer area as a field for optimists. He said that these technologies must not merely be adopted and implemented, but institutionalized as well. **James Baker** of the same group emphasized the need for technology to be self-instructing in its own use.

Thomas Patton (**GE Ordinance Systems**) described his firm's generic delivery system called VISTA (Videodisc Interactive System for Training and Aiding), which includes a touch screen monitor, an IBM PC with a GE high-speed high-resolution graphics generator with overlay capability, and a Sony disc player. Several training applications have been developed for the system on a variety of ordinance equipment, such as the Bradley Fighting Vehicle and the GE Diesel-Electric Locomotive.

GE sought to reduce the amount of training time required on the actual equipment while improving performance. One of the most important features of VISTA is the organization of the data base with no item more than three or four touches away. Patton said that GE is developing an MS-DOS based authoring system for program development, and he expects to be able to offer the graphics board with overlay capability for under $1,000 in the near future. The company has just entered into a national pilot program with the Department of Labor which will lead to ten interactive videodiscs for teaching basic machining techniques. These discs will be publicly available for only the cost of replication *(413/494-4579)*.

"The American education system is in deep trouble," **Alfred Bork** (**University of California**) said, "and the only thing on the horizon that might deal with its major problems is technology." However, he stressed, a nation with a poor educational system cannot maintain a high technological base. Unfortunately, even increased time on second-rate materials is of little value, and Bork sees much of the current educational software as inadequate. Bork presented several design principles that have emerged in his work for such development processes. These include:

- starting with the learning objective, not with the technology;
- a number of review and improvement cycles;
- frequent interaction (about every 20 seconds);
- never presenting more than two or three sentences on a screen, as more will not get read; and
- using blank space on the screen as a free commodity.

Bork then presented several lists dealing with the quality of interaction and evaluated the ranges of types, inputs, and levels. He further observed that it is difficult to shift instructional design thinking from linear to interactive and from verbal to visual *(714/786-8255)*.

Harry Shoemaker (division manager, **AT&T Information Management**) outlined his company's approach to developing videodisc training programs. Shoemaker said that AT&T intends to produce high volumes of training materials of premium quality and deliver them in a timely manner to clients. He noted the complexity of working with multiple technologies and disciplines but also observed that the broad team required afforded great potential for mutual enhancement. In a separate conversation after his presentation, Shoemaker confirmed that AT&T was effectively now open for business, offering production and development services to outside clients as well as developing training products for outside sale *(201/631-4000)*.

Q&A: Skip Atwater
Digital Equipment Corporation

***Digital Equipment Corporation**, the second largest computer company, introduced its first disc-based product in April 1983. The Interactive Video Information System (IVIS) is a multimedia learning station, incorporating the Digital Professional 350 computer, Sony 1800A videodisc player, monitor, and custom videodisc design and production services. In February, Digital introduced a number of enhancements for the IVIS, including a new courseware development program, a generic courseware library, and special consulting services (see* **The Videodisc Monitor, March 1984 issue**). ***William "Skip" Atwater**, strategic planning and research manager, spoke with us at the recent SALT conference in Orlando. We discussed what his firm is planning and where Digital sees itself with interactive video.*

MONITOR: How did the IVIS project come about at Digital?

ATWATER: Our Field Service division needed a cost-efficient method to train its engineers. IVIS grew out of the Educational Service division's response to that internal problem. We have 14,000 field engineers who need to be trained on the products. By 1987, we estimate that there will be 30,000 field service students taking 15,000 student weeks of IVIS instruction per year. The training will be done in our 200 training centers worldwide (each with its own IVIS), with regular disc material and updates received there.

Training for these field service engineers (per diem, travel, design of the courseware, tuition, rental of the building, etc.) without IVIS is projected to cost $135 million in FY 1986, and $183 million in FY 1987. Using IVIS to do the same training, the projected costs are significantly lower— $104 million in FY 1986 and $116 million in FY 1987. Digital projects that it will save approximately $98 million by using IVIS in this time period. In addition, our educational psychologists have verified that there is better learning retention, faster learning, improved repair quality, and better overall student receptivity.

When we saw how well the system worked for us, it made sense that our clients would also find it valuable. We offer training as a basic part of any computer sale to the customer, and IVIS is essentially a training delivery system. The latest enhancements include an authoring system that supports the development of applications, a touch-screen system, and generic titles. Digital's courseware division will have the first round of four titles available shortly.

MONITOR: What, when, and for how much?

ATWATER: *Introduction to Programmable Controllers* will be available in July for $3,500; *Introduction to Computer Concepts* in August for $5,000; *Introduction to Software Concepts* in August for $2,500; also in August, *Raster Graphics* for $750. Each course comes with one or two videodiscs, full documentation and one to five floppy disks. Each takes from one-half day to four days to complete. The discs provide visual support while all the text, graphics and controls are on IVIS.

MONITOR: How successful has the IVIS introduction been?

ATWATER: The several major Fortune 50 companies presently using IVIS in the prototype stage are very pleased with it. It's a long process to move a company into training technology. Our job is not just selling hardware, it's planning long-range, cost-effective solutions to customer problems. We not only offer products, but develop programs and proposals to show management how computers make sense in the corporate environment.

MONITOR: Do you see Digital participating in the low-end market?

ATWATER: Digital is very interested in both high-end and low-end solutions to traditional data processing problems. We sell to several types of users. Our customers are companies with a sense of what their problems, directions, and current and future need for computing tools will be. Digital is first and foremost a computer company. The videodisc is simply a logical extension of the computer—visual solutions to traditional data processing problems. Visual data is not foreign to the way people think and deal with information. It's very logical for a company with Digital's extensive software applications and significant OEM hardware development experience to be involved in this area.

I think that Digital is an enigmatic company to most of the people in the video industry. They may not know that, in fact, Digital sells more computers to the government than any single vendor in the market today, including IBM. With IVIS, Digital has made a major commitment to a whole new area of information. It's important for the people in the video area, people looking at personal computers, and traditional companies with information, training, or education problems to consider Digital as a company that is sincerely interested in helping them understand and solve their problems *(617 276-1431).* (•)

Report

"Evaluation of the Distributed Instructional System for the US Army Improved HAWK Missile Fire Control Maintenance Course"

A test and evaluation was conducted at the US Army Air Defense School at Fort Bliss, Texas, to determine if videodisc and microcomputer technology combined and configured into a generic Distributed Instructional System (DIS) would be a viable alternative delivery system for training equipment maintenance personnel. Computer-aided instruction (CAI) and videodisc simulations were prepared for the DIS using as subject matter the Integration Checks for the Improved HAWK (IHAWK) Air Defense System. Results from this test have just recently been made public, and once again, disc-enhanced CAI training has won high ratings.

Summary of Test Results			
	# Students Attempting Test	# Students Solving Problem	Average Solution Time
Ongoing Instruction (no simulation)	16	4 (25%)	9 min. 58 sec.
CAI Instruction Only (no simulation)	10	10 (100%)	9 min. 59 sec.
CAI Instruction plus Videodisc Simulation	20	20 (100%)	4 min. 57 sec.

The Distributed Instructional System, developed by WICAT, consists of a second-generation microcomputer and a computer-controlled videodisc player. The DIS uses distributed computing power and with generic properties, so that high-fidelity simulations of several different pieces of equipment may be run independently, simultaneously on neighboring work stations.

The basic hardware configuration used for delivery of the IHAWK Maintenance Training Program consists of a WICAT System 100 Executive Station and four student stations. The Executive Station is configured with a 40 megabyte Winchester hard disk and 512K of main memory. Each of the student stations includes a WICAT Desktop Computer with 512K main memory, a Pioneer (DVA) PR-7820 3 industrial videodisc player, a color monitor, and a specially-designed, hand-held keypad. The system courseware includes not only the simulation programs, but also prerequesite lessons of instruction and a student management and record-keeping system, as well as an exam presentation and maintenance program.

A group of 46 students were involved with the test: 16 control (regular classroom, no CAI), 10 CAI-only, and 20 CAI with videodisc enhancement. The results of the evaluation indicate students provided with CAI and disc simulation found test problems more often or faster than the control group or the group working with CAI only (see table). System evaluators also found the program to be cost-effective, portable, and generally quite efficient. The success of the pilot generic program may encourage implementation of new disc-based CAI instruction systems in similar training situations in the US military. (*Donald Kimberlin, Fort Monroe VA, 703-727-2111 or Lt. Bunderson, WICAT Education Institute, 801-375-3855.*) (•)

Media Watch

Interactive Media (Prentice-Hall) by Diane Gayeski and David Williams is an overview of interactive disc, tape, and other current systems. The book also includes several first-person essays by other leading developers and users in the field, including robot inventor Carl Frederick, CPR training system developer David Hon, and the creators of the computer animation for the Disney film *Tron*.

International Bildersplatten Katalog (International Videodisc Catalog) 1983, edited by Hannes Dahlberg, lists (in German) publicly available CED and laser videodiscs for both NTSC and PAL television formats. (*Schickle and Schon, FilmeBild Audiovision AG, Kufurstendamm 71, 1000 Berlin 31, West Germany.*)

The ***ICIA (NAVA) 1984 Membership Directory*** has just been released by NAVA, the International Communications Industries Association. The who's who of the organization contains nearly 1,000 listings, including product service information, and complete contact data. (*3150 Spring Street, Fairfax VA 22031.*)

Electronic Education (February) profiled the LaserSoft integrated system from Micro-Ed and the Society for Visual Education. (*1311 Executive Center Drive #220, Tallahassee FL 32301.*)

April's ***Electronic Learning*** ("Scholastic's Magazine for Educators of the 80's") features an extensive section on interactive videodisc, including a buyer's guide to hardware and software for the educational market. (*730 Broadway, New York NY 10003.*)

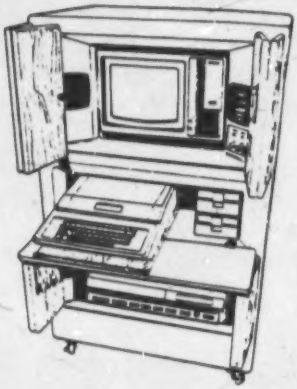
Videodiscs in the classroom is the subject of an article by Ron Thorkildsen and Susan Friedman in the latest ***T.H.E. Journal*** (April). The Utah educators discuss their work on a project on Special Education. (*2922 South Daimler Street, Santa Ana CA 92705.*)

Just in time! The latest ***Video*** (May) compares interactivity in the two videodisc formats in "Both Laser and CED Let You Talk Back. Which Listens More?" by Dawn Gordon. (*405 E. 54th Street, New York NY 10022.*)

The RCA shut-down of its CED player operation made a big splash in the mass press, with major news or feature articles in the ***New York Times***, ***Washington Post***, ***USA Today***, ***Time***, ***Newsweek***, and ***Business Week***, as well as items on **ABC-TV**, **PBS**'s ***McNeil/Lehrer News Hour***, and others. And you can look for tons of analysis, post-projections, and hindsight observations in all of the video newsletters and magazines for months to come. (•)

University of West Florida Training Project

by Richard Smith, associate director
UWF Office for Interactive
Technology and Training



In 1979, Florida's umbrella social work agency, the Department of Health and Rehabilitative Services (HRS), decided to train certain of its newly hired workers (approximately 500 annually) using microcomputer-driven interactive videodiscs. Aid to Families with Dependent Children (AFDC) was the first program earmarked for conversion to this system. In October 1981, the University of West Florida's Office for Interactive Technology and Training (OITT) was selected to design and produce the training package.

The massive package that resulted *(see Vital Statistics box)* was ready for pilot testing in the fall of 1983, with a state-wide rollout scheduled for February 1984. The total development cost of the program approached one million dollars, not counting start-up and learning expenses. About 60 percent of the money went for in-house skills, with the balance for production.

The trainer's role within this program was hotly debated in the early stages of the project. Many argued that the new training should be totally self-sufficient, allowing a single Learning System to be placed by itself in the most remote HRS office, far from any trainer. Others insisted that experienced trainers have an integral role in the instruction delivery. This latter position was eventually adopted. The success of this decision is reflected by one trainee, who gave this overall reaction to the program: "B+ to A-, considering that it's a videodisc image that's doing the talking. Even though you can have feedback by answering yes or no or accessing any part of the disc for review, it's still nice to know that there is a flesh and blood trainer there to help."

The context of this training (an employment requirement), requires the presence of a human trainer to make exceptions and to mediate between inhuman questions (no matter how carefully researched and posed) and human answers. The instruction, designed for a public welfare agency, could not have succeeded without the presence of professional social workers serving as trainers.

Aid to Families with Dependent Children (AFDC) Training Program

The University of West Florida
Office for Interactive Technology and Training (OITT)
for the State of Florida
Department of Health and Rehabilitative Services (HRS)

PRINCIPALS:	Elizabeth Wright—*Project Director* Richard Smith—*Technical Advisor* Patricia Lynett, Dennis Knott, Marcia Howard—*Administration* Janis Bartlett, Barney Whitley—*Programmers* Martha Rogers, Susan Mathis, Bruce Warnock—*Script Writers*
SPECIFICS:	A 160-hour training program consisting of nine videodisc sides, 78 floppy disks, and eight reference manuals each in 120 total systems throughout Florida.
HARDWARE:	Pioneer PR-7820/3 videodisc player Apple II+ computer Calcomp VA-1 interface Calcomp Learning Center Cartell Zenith/Heath color monitor
PRODUCTION:	Nebraska Videodisc Design/Production Group
PRESSING:	3M Optical Recording Project

Fort Lauderdale was chosen as the pilot test site, as the maximum number of trainees could be assembled here. The University's request for 50 test trainees proved impossible to fill. In the end, 13 candidates for permanent positions reported to Fort Lauderdale to begin training with the new system. This small number precluded any statistically significant conclusions to be drawn; therefore, the present results should be viewed as largely anecdotal. Nonetheless, each of the 13 trainees faced the same performance requirements as any newly hired worker: "Your continued employment requires that you successfully complete this training."

The test was conducted on 13 Learning Systems in a single large room and was supervised by a member of the University staff as well as the HRS trainer, who had been thoroughly briefed before the beginning of the training. The University supervisor observed the training, recorded interactions, and assisted with equipment malfunctions.

Printed materials supplemented the computer and videodisc exercises and lessons. One important goal of the program was to familiarize trainees with the AFDC Policy Manual, their day-to-day reference guide. Another text, the trainee's Reference Book, organized and summarized each computer lesson. As this book was to be used only during the instruction period, we were careful to monitor any signs of over-dependence on this training aid. A third auxiliary item was a packet of forms used in instruction and practice activities.

The trainer introduced guest speakers to the class from time to time, which interrupted the normal self-paced flow of instruction. Trainees were also scheduled to spend an occasional afternoon on the job line, observing the actions of trained social workers. We were delighted to hear of trainees catching real workers in errors of fact and interpretation.

Current standard training cycle for this material is four to five weeks (160 to 200 hours) of classes. The new interactive instruction was completed by the trainees in 60 to 194 hours. Average course completion time was 120 hours, a 25 percent reduction in instruction time compared to conventional training. The 60-hour fastest time represents a 63 percent reduction in instruction time (a remarkable figure in any context), while the slowest trainee required 20 percent more time than was required for standard training.

In one unanticipated element of the individualized instruction, several pairs of trainees formed and kept a similar progress rate. For instance, the student completing an exercise would wait for his partner to finish before taking a break, and the two would discuss the details of the training before returning to the next segment. These discussions often enhanced instruction within the pair—a fresh reminder that individualized training can often benefit from peer discussion.

Trainees often found it difficult to accept their own progress as adequate, and often asked if they were "on schedule." This feeling was emphasized when trainees discovered the trainer's nominal schedule (used in scheduling outside speakers), which was then assumed to be the the expected performance rate. Those who believed themselves behind schedule began coming to work early and staying late, on an entirely voluntary basis.

Each trainee's activities were noted every working hour (from common beginning through completion four to six weeks later), in order to determine the amount of time spent on each task *(see Table for results)*. Almost half of each trainee's time was spent reading and responding to computer-generated text. Indeed, the fact that trainees viewed disc-generated segments or still frames only eight percent of the time shows that the choice of delivery medium depends strongly on the nature of the training to be delivered. This training program requires extensive use of existing job manuals as well as specially prepared training aids. We used video in those situations where it was important to depict unchanging human situations, while placing the varying situation responses on updatable computer disks.

Many break sequences were built into the training, typically before or after long and involved situations. We were not surprised that trainees felt quite free to take breaks at any time, simply by leaving the system at a response point. As we had designed no "time-out" strategy in the training, this self-initiated break routine caused no problems in the instruction, and enhanced the trainee's feeling of control over his own schedule.

The price for this freedom is also reflected in Table 1, which indicates that trainees spent a large portion of their instruction time on break. On one hand, we realize that the trainee must have frequent relief from the eye strain and concentration of focussed training. On the other hand, we raise the suspicion of permissiveness when our frequent break policy leads to an average of one hour of break time for every six hours of work time. This figure is only an average; one out of the 13 trainees was found on self-scheduled break twice as often as average (29 percent).

Five percent of the trainee's time was spent in conference with the trainer. Typical interactions occur when the trainee had questions about the presented material, when the trainee believed that an answer to a test question had been scored incorrectly by the program, or when the program had called for trainer intervention. The last category included module tests, which need a password for access and require the trainer to be at the trainer's side to go over missed questions.

ACTIVITY		PERCENT OF TIME
Computer-generated screen		43
Videodisc-generated screen		8
External materials		
	Reference book	10
	AFDC Policy Manual	9
	Practice forms	11
Conferring with trainer		5
On break		14

This series of photographs shows pilot trainees at work with the AFDC videodisc-based training device.

Final test scores may be compared in two ways. Nine of the 13 pilot test participants completed the written final test designed for and used in the existing trainer-led classroom instruction, in addition to the CAI-disc test. A comparison of test scores of the pilot test participants with the scores of a concurrently-run classroom group reveals that CAI-trained students passed the written test more frequently than the control group. While 56 percent of the classroom group passed the final test, 89 percent of the CAI-videodisc trainees passed. These results are startling, as the CAI trainees had already passed the interactive test and knew they would go on to the job. Therefore, they probably gave less than full effort on the written test. According to experienced AFDC trainers, the CAI group completed the test in less than one half the normal time, giving this supposition some credence. The pilot group averaged a final test score of 85 percent, with a score of only 70 percent required to pass.

Experienced instructors in the AFDC program found that the CAI test group completed the final examination in less than one half the normal time.

Originally, classroom trainees were concurrently scheduled to complete the CAI final test. However, due to their poor performance on the written test, urgent need for on-the-job employees, and computer logistics, this was not possible. A comparison between CAI and written final test scores indicated parallel performance; those who scored highest on the CAI test, for which they were prepared, also scored highest on the written test.

On completion of the AFDC training, the pilot test group attended a conventional training class in Food Stamp program administration. Thus, we were able to compare their reaction to the two modes of training. Every individual preferred the computer-based instruction. Comments included: "If I had to do any further training, and had a choice between classroom or computer-based instruction, I'd choose the computer," and "I felt I didn't know very much about food stamps after classroom, trainer-led instruction. I am still very insecure about it. Thank goodness for the computer!"

Computer animation sequences, with accompanying sounds and music, proved counter-productive in the single training room situation. The trainees opted early in the program to use earphones for sound isolation. While a beeping and whooshing computer could be screened out well enough by its earphoned trainee, the racket could be heard all too well by anyone else in the room. The only solution to this problem seems to be suppressing all beeps during programming and putting all musical sounds on the disc's second audio channel. This surely poses a headache to the programmer who must synchronize these sounds to computer animation.

We also made some interesting observations regarding equipment dependability. During the average 120-hour duration of the test for each of the 13 systems, three of the Pioneer videodisc players were sent out for repair, and two others could not be used for more than an hour or so at a time due evidently to heat buildup. These less occurrences amount to a mean time between failure of 312 hours, less than 10 percent of the rates reported elsewhere on other player models. It is not known whether this high failure rate was due to engineering design, initial installation problems, lack of adequate ventilation, or other causes. (Editor's Note: These players were originally purchased in 1980 and dispersed throughout the state. Prior use, storage, handling and transportation factors are unknown.) Other, new, Apple II+ microcomputer, housed in the same space, failed during the test.

CBIT will conduct follow-up studies for at least six months following the full implementation of this program. These studies should provide valuable data on the program's performance in everyday use by a statistically significant population. (n)

***Richard C. Smith** is the technical director for the Office of Interactive Technology and Training at the University of West Florida. He is also the chairman of that institution's Department of Physics. Smith's interest in learning techniques and technology dates from 1972, when he worked extensively with self-paced, mastery-based university physics courses.*

Senator PELL. Thank you very much, indeed, Mr. Miller.

I am wondering if you feel that the bill would be opposed by commercial interests, feeling that they already have a lock on some of these operations and do not want to see it widened?

Mr. MILLER. I think it is very possible. I think that is a question that would need to be addressed directly by the Director. He would need to establish guidelines by which technologies that have been transferred out of the Government may in some areas be restricted from broader marketing, I think you address that in the bill when you deny ownership rights and the ability of anyone to copy the technology that they have obtained and that the technology as modified goes back to the pool.

Senator PELL. Do you think the timing is ripe for this bill at this time or do you think we should wait a year or 2?

Mr. MILLER. I think it is ripe. It is going to take a little while to get up to steam anyway. But the technology is moving ahead very rapidly but it is still kind of a limited access to the smaller companies and to educational institutions who hunger for it. It is very rare that you see any teacher or a college president or anyone who sees what can be done with it that does not want it. Their question is when and how, not whether. They want it and anything that we can do to promote that use, I feel, is very timely.

Senator PELL. Well, I thank you very much, Mr. Miller, for being here.

Is Mr. Merrifield on his way here?

Department of Commerce Staff. He has left the building, Senator

Senator PELL. I am afraid that this is the last witness, so I would ask that his testimony be inserted in the record as if read, without objection

Is this Mr. Merrifield? I feel a little apologetic, because I am supposed to go over onto the floor for a bill. I was wondering if it would be agreeable with you, and I hate to suggest that, if your statement could be inserted in the record as if read. And if you will give us the answers to some questions. Otherwise, I can come back here in half an hour, 40 minutes, if you would want to wait. I would hate to impose on you and any of the other people, for that reason. Which would you prefer?

STATEMENT OF DR. D. BRUCE MERRIFIELD, ASSISTANT SECRETARY OF COMMERCE FOR PRODUCTIVITY, TECHNOLOGY AND INNOVATION, DEPARTMENT OF COMMERCE, WASHINGTON, DC

Dr. MERRIFIELD. What you suggest would be fine. I would like to submit my testimony for the record and I would be delighted to answer questions.

I would like to congratulate you on this initiative. I think it is one of the most important social problems that we have, and it is very critical that we understand what the dimensions are and how best to approach it.

So I really am very enthusiastic about helping you with this and supporting you in any way that we can.

[The prepared statement of Mr. Merrifield with attachments follow:]

STATEMENT OF
D. BRUCE MERRIFIELD
ASSISTANT SECRETARY OF COMMERCE
FOR PRODUCTIVITY, TECHNOLOGY AND INNOVATION
BEFORE THE EDUCATION SUBCOMMITTEE
OF THE
SENATE COMMITTEE ON LABOR AND HUMAN RESOURCES

JUNE 28, 1984

on

S. 2561 THE TRAINING TECHNOLOGY TRANSFER ACT

Mr. Chairman and Members of the Subcommittee, I am pleased to have this opportunity to express my views on S. 2561, the Training Technology Transfer Act. The retraining of displaced workers and the workforce in general is an activity of the utmost importance to the Nation. The transfer of educational training programs already developed by the Federal Government to the private sector and to State and local governments for use in workforce training programs is extremely important. We defer to the Education Department on the specifics of this proposal to establish a new office in that agency.

We support the intent behind this legislation to stimulate the production and use of advanced training technologies in the private sector. However, we do not support enactment of S. 2561 for a number of reasons. Our principal concern is over the proliferation of federal agencies and offices concerned with and engaged in the activities addressed by S. 2561. In addition to the Department of Commerce, the Departments of

Defense, Education and Labor, and the National Occupational Information Coordinating Committee (NOICC) are all active, both formally and informally, in this area.

With regard to some substantive issues raised by the bill, it is well to step back and look at training requirements in more general terms. This decade will see the restructuring of U.S. industry, caused by three fundamental forces of change. These forces are:

(1) The technology explosion that has generated something like 90 percent of everything we know in the sciences in the last 30 years, and which will double our technical knowledge base again in the next ten or fifteen years. As a result, the life cycle of products and processes will continue to be compressed (3 to 5 years now in electronics, and a maximum of 5 to 10 years in most other industries). Moreover, any set of skills can be rendered obsolete in this same period of time;

(2) The strategies being adopted by some foreign countries to dominate world markets. These strategies, which involve a purposeful attempt through direct government-industry collaboration, to capture market share for specific products on a global basis will intensify world competition;

(3) The emergence of resource-rich lesser developed countries, which have traditionally exported only their raw resources, but that are now installing (or purchasing) turnkey value-added plants to multiply returns on their scarce resources and to capture market share in many basic industries.

These forces pose significant competitive challenges to both our more mature industries and our growing high technology industries. The rapid pace of technological change and foreign competition may well displace large numbers of our employees. Estimates range from half a million to a million workers per year or more. Also, the skill requirements of many remaining jobs will continue to change, and at a faster pace. Thus, the perennial problem of the mismatch of worker skills with the available employment opportunities is likely to continue. In today's world market, a skilled workforce is crucial to maintaining competitive industries.

We must recognize that the training and retraining of the workforce needs continuous and systematic attention, particularly for workers who are displaced through no fault of their own.

Recent experience has shown that advanced educational technology, which includes computer based instructional

programs, interactive video disc systems, computer programs for micro-computer training devices and audio-visual devices, and programmed learning kits, can increase productivity substantially. For example, the use of the computer-based teaching system called PLATO is reported to increase the rate of learning by 30% over traditional teaching methods. The application of advanced educational technology can sharply increase teaching productivity in terms of both shortened student learning time and greater retention levels.

Because of the preliminary successes of educational technology, the Department of Commerce initiated a taskforce on it, with membership from several federal agencies. The taskforce found, first, that there exists a conservatively estimated $2 billion immediate market for educational technology with a much greater future sales potential, and, second, that the market is highly fragmented because it is still in its infancy. Further, channels of communication among suppliers and users of educational technology do not exist to any great degree. The Department of Commerce is pursuing ways and means to bridge the communication gap between suppliers and users. We expect that the normal development of markets will help to close this gap.

In addition to the market problem, this Administration is concerned about the adequacy of incentives for the private sector to commercialize newly developed educational technology. Any legislation to foster the transfer of such technology should address this issue. Unfortunately, S. 2561 appears to be based on the assumption that private contractors will not be allowed to own patents, copyrights, or technical data that apply to the training technology they develop under its provisions. This runs counter to the Administration's efforts to permit private sector innovators to own the technology they develop under Federal contract.

The policy of allowing contractor ownership of the fruits of Government-sponsored research and development is a major response of this Administration to the need for generating incentives to promote technology development in all fields. The Federal agencies were instructed to carry out this policy, to the extent permitted by law, in the President's February 18, 1983 Memorandum on Government Patent Policy. Further, contractors ordinarily are permitted by Federal agencies to own, subject to a license in the government, technical data generated in the performance of Federally funded research. This policy is implemented by the standard rights in data provisions attached to the contracts.

Accordingly, Mr. Chairman, although we support the intent of S. 2561, we consider it inconsistent with the Administration's technology transfer policies and with its desire to streamline and simplify the Federal government.

I will be happy to answer questions, Mr. Chairman.

LARGE SCALE R&D PARTNERSHIPS

U.S. DEPARTMENT OF COMMERCE

Office of Productivity, Technology, Innovation

National Technical Information Service
Sales Department
5285 Port Royal Road
Springfield, Virginia 22161
(703) 487-4650

FOR FURTHER INFORMATION CONTACT:

Assistant Secretary for Productivity, Technology and Innovation,
Room 4824
U.S. Department of Commerce
14th and Constitution Ave, N.W.
Washington, D.C. 20230

Question 1: Can the Department of Commerce help in training technology transfer under its current level of funding and, if so, how?

Under our current level of funding, the Department will be able to continue a modest non-interventionist catalytic role in accelerating the diffusion of technology. This role has worked well for DOC's licensing of government patents. This catalytic approach is a model for transferring training technologies.

The catalytic role involves convening selected public and private sector people to help them focus on specific programs and initiatives for transfer.

Question 2: I know that your Department has advocated R&D Limited Partnerships. Are they available for the R&D involved in courseware development and if so, how?

The R&D Limited Partnership (RDLP) concept is a highly flexible financing tool for any project which consists of "research and experimentation" within the meaning of section 174 of the Internal Revenue Code. There is some ambiguity here in the Treasury definition of R&D, so the development of courseware may or may not fall within the language of section 174, depending upon the nature of the research involved. Research into hardware systems probably would qualify, but defer to the Department of the Treasury on this issue.

Question 3: Can training technology help increase U.S. productivity?

Yes. There is a direct link between training, retraining, and productivity. There are several ways in which training and productivity are linked, including the following: (1) training technology enables workers to learn complicated tasks more quickly and perform them more efficiently; it also provides them with special skills needed to operate newer and more complex high-technology equipment; (2) training technology permits the more rapid diffusion of new and continually changing techniques required for automated flexible manufacturing and other increased productivity processes; (3) training technology allows workers to adjust to structural dislocations more easily, thereby facilitating introduction of new more productive technology and lowering unemployment and other social overhead costs; (4) training technology permits workers to be continually reeducated and reskilled to discover their special interests and abilities, thereby promoting efficiency and hopefully, innovation. And, of course, increased productivity helps business competitiveness and reduces inflation.

A more general finding on the relationship of education and training to productivity was noted by Edward Denison (former Associate Director for National Economic Accounts, at the DOC's Bureau of Economic Analysis) retired in 1979. Dennison concluded that the role of education in productivity augmentation has been very strong and undiluted in its impact over time. Since Denison's primary work covered only 1948 through 1976, his work may have understated the case, i.e., new knowledge was very critical in his calculations; new knowledge is now growing at an increasing rate.

Question 4: Do you agree "...i.e., that the public's investment in training technology should be shared as widely as possible to promote private sector job training?

There is a pressing need for the application of advanced education technologies to the skilling and reskilling of today's (and tomorrow's) workforce. The rapid pace of technology change, the increasing pressure of foreign competition, and likelihood of increased human productive life (through advances in health technology) will mean that most workers may need to be continually reskilled. Thus, all elements that can contribute need to be mobilized, including in-place government capabilities that can assist in transforming existing private sector and government expertise into commercializable products, e.g., courseware for displaced workers.

Senator PELL. I really appreciate your thoughts and encouragement and I wonder if you see a conflict between the Office of Training Technology Transfer that the bill suggests and the present National Technical Information Service with which I know you are familiar.

Dr. MERRIFIELD. Well, the NTIS is basically a data base, it is the world's largest data base and it is a mechanism for disseminating information, particularly Government-funded technical data. But we are trying to extend its capability rather significantly to identify in a much more effective way the categories of information that are useful and make those supportive to this sort of initiative.

But basically there is a gap between the two at the present time.

Senator PELL. I thank you. I really feel apologetic but I am supposed to be managing a bill on the floor at this point.

I once again thank you for being with us.

So without objection, your statement will appear in the record as if read and the questions and answers the same way.

The record will be kept open, without objection, for a week so that any of the members of the subcommittee will be free to put any written questions to the witnesses. And if the witnesses have any further remarks that they care to make, the record will be kept open for that week.

I again thank our chairman, the Senator from Vermont, for permitting me to hold this hearing and look forward to pressing ahead on this objective. This is just the first of what will be a good many efforts that are made before this bill sees the light of day.

Accordingly, the subcommittee is adjourned.

[Whereupon, at 11:05 a.m., the subcommittee recessed, to reconvene subject to the call of the Chair.]